CYSDEM

USER'S MANUAL

BY

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CYSDEM

user's manual

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ABSTRACT

CYSDEM is a new FORTRAN based simulation language. It is used to simulate business information systems. The main feature of CYSDEM is that it concentrates on delays and distortions, to which information in actual systems is subjected to. Therefore, CYSDEM allows a more realistic representation of the movement of data within an information system.

CYSDEM is based on a schematic representation, of the information system under consideration, called the CYBERSTRUCTURE. The CYBERSTRUCTURE is constructed by the user. It helps the user in identifying relevant information.

Any new computer language, requires careful verification and complete documentation. This report contains an introduction to simulation and a user's guide. Partial verification of CYSDEM was performed using a production-distribution system from Forrester's "Industrial Dynamics". The example is explained and the results are included in this report.

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CHAPTER I

INTRODUCTION

1- The Information System

In the past,organization managers have taken their decisions,on the basis of judgment tempered by experience or,by hunch. To some extent this is true to-day,the skills of a manager still are,and always will be,an essential factor in the success of an organization unit. In spite of the recent advances made in management services and operations research,the ultimate decisions must still be made by management. However,the complexity and the rapidly changing environment of to-day's organizations make it progressively more difficult for one man to have available information and experience to identify all tasks and their sequential relationships.

It is necessary now that major decisions be made, only afterconsultation between men with different responsibilities and experience. Those men must be aided by specialists who can provide sohpisticated,recent and relevant information. The availability of this information enables to-day's managers to get a clearer picture of the factors that effect and get effected by,their decisions. Such information is provided by the information system of the organization,which is defined by Daniel as:

'an organized method of providing past,present and projection information relating to internal operations and external intelligence. It supports the planning,control and operational functions of an organization by furnishing uniform information,in the proper time frame,to assist the decision making process'.

The design of an information system that will supply management with the required information,is not a straight forward task. The approach taken by this manual,is to use simulation to determine the suitable information system. For a justification of the simulation approach,refer to the work done by R.J.Welke.

2- The Simulation Approach

During the last decade,computer simulation of physical systems has become a valuable problem-solving technique for systems analysts and managers in various fields as economics, military operations,planning and management of industrial organizations. Simulation is implemented by building a model to study the problem. Models may be either physical or logical. Physical models are replicas,often on a reduced scale,of the object under study. The wind tunnel,that is used to study the aerodynamic behavior of a proposed aircraft,is a physical model. Logical models are implemented by using the digital

computer and an appropriate programming language.

The following definition of simulation,by S.Greenberg, suits the purpose of this manual:

> 'Simulation is a way of using a computer to produce a reasonable model of a system under study. This model takes the form of a program which contains entities representing the elements of the real system. In executing the program,the computer simulates the behavior of the system. It also keeps track of what happens at various points in the system and accumulates statistics as the run progresses. It produces an output from which the behavior of the model can be deduced'.

3- Introduction To CYSDEM

Generally,there are two basic groups of simulation languages:

1) General purpose languages such as FORTRAN,SIMSCRIPT and GASP.
2) Special purpose languages,this group is oriented towards a specific class of problems. One example is DYNAMO which is designed to represent a collection of industrial processes by continuous models. Another example is the job-shop simulator,in which

the fuction of the user is reduced to supplying the simulator with a set of parameters. GPSS is a block-diagram,transaction oriented language,where each block remains idle until entered by a transaction.

Figure 1.1 shows the relative location of some simulation languages with respect to orientation and generality of application.

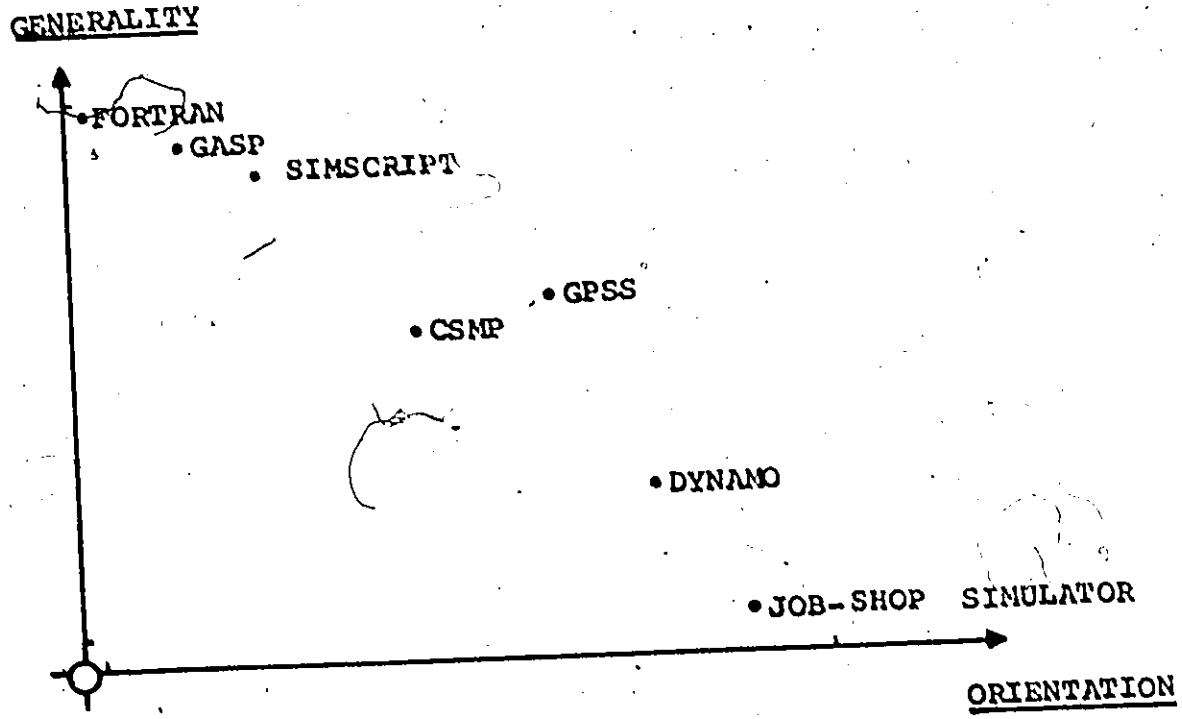


Fig. 1.1.

Theoretically,most of the above mentioned languages may be used to simulate the information system under consideration by appropriate translation of the problem into a simulation program. However,the approach of a special simulation language is feasible,if this language:

- Facilitates the formulation of the model of the information system.
- Is easy to program in and may be used directly by the analyst. This reduces the communication problem.
- Provides a good error detection and reporting mechanism.
- May be implemented on a wide range of computers.

The approach taken in this manual is that a graphical representation of the information system, called the CYBERSTRUCTURE, is set by the user.

An important characteristic of an organization is that it is not static. Effectively, an organisation is a dynamic entity and consists of a set of processes. These processes act on available data, resulting in decisions and effecting more data. The data is made available to the processes through data links. In other words, the data links are the channels that are used to transmit the data between the data source and the process that uses this data and vica-versa. The CYBERSTRUCTURE is made up from three major elements: processes, data and data links. The associated simulator CYSDEM, is a special simulator and is used to evaluate the CYBERSTRUCTURE of the organization unit.

4- Characteristics of Simulation Models

This section is devoted to a survey of concepts and terms that will be used in this manual.

System A collection of mutually interacting components (such as money,machines and orders),carrying out a defined mission. The system is seperated from it's environment by the system boundary.

Entities Within the boundaries of the system are entities (such as files,personnel and machines). These entities interact together and are engaged in various activities. Each entity has a limited number of operating characteristics,i.e attributes,each attribute is represented by a variable during the simulation copmuter run.

State Each entity or,group of entities or,the whole system is said to be in a certain state,when each of the associated attributes has a certain and specific value.

Activity Activities move the system from one state to another. These activities change the attributes of the entities,therefore,possibly changing the state of the system. Activities do not have an instantaneous effect on the system,but they have

a certain duration after which, the system achieves a new state.

Event — An activity is initiated by an event. For example, consider a service office. The arrival of a customer to the office is an event, while serving the customer is an activity with a certain duration. The departure of a customer is another event. Events are instantaneous and do not have durations. Figure 1.2 shows a system that was in state A and moved over time to state B as a result of activity 1. Activity 1 was initiated (triggered) by event X at time a.

The attributes that characterize an entity are selected by the user. Therefore, only those attributes that are relevant to the goal of the simulation need be considered.

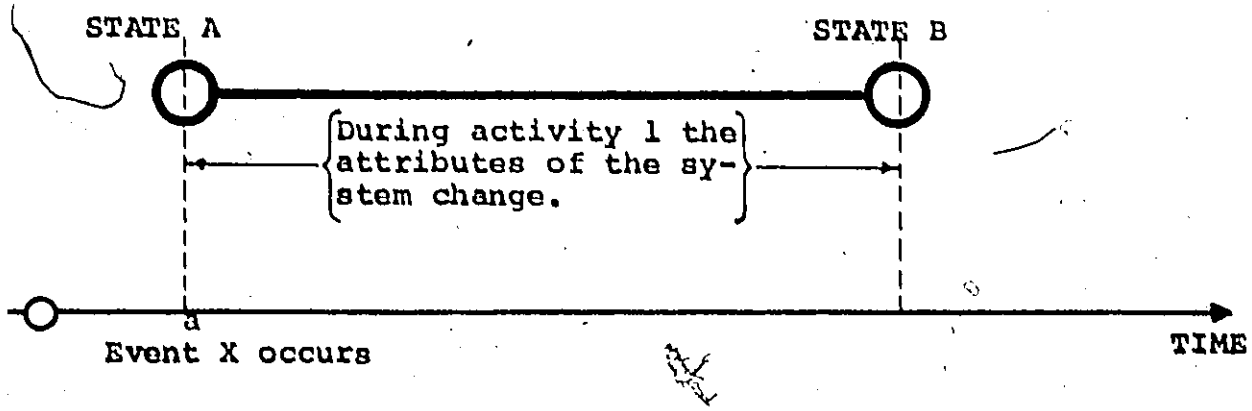


Fig. 1.2.

The following is a simple example of a sales office. Customers arrive to the sales office,which is staffed by two clerks. The clerks place the customer's orders in triplicate copies. One copy is sent to the warehouse. The warehouse ships the amount stated on the copy to the customer. Then,the copy is filed in a filing system. The second copy remains in the sales office where it is batched with other copies. Later,the batch is sent to headquarters, through an information communication channel. This channel may be mail or,telex or,an on-line batch data collecting terminal. The third copy is given to the customer. The system is shown in Figure 1.3.

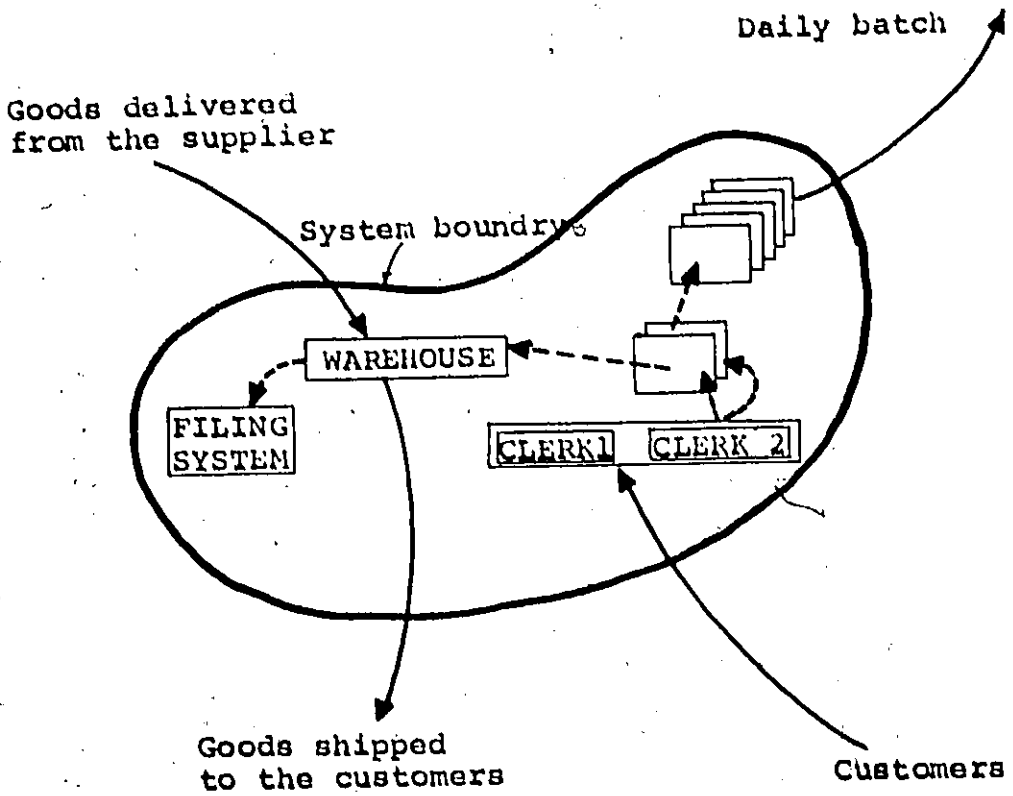


Fig. 1.3.

Entities of the above system and their possible attributes are:

ENTITY	ATTRIBUTES
1) Sales clerk	- Processing speed. - Salary. - State...0-idle 1-busy
2) Order transactions (3 copies)	- Account Number. - Customer name. - Delivery address. - Number of units. - Price per unit. - Total price.
3) Filing system	- Capacity. - Cost. - Delay in information storage and retrieval.

Possible events are:

Event(1)...Arrival of a customer which will initiate the activity of placing an order by one of the sales clerks.

Event(2)...The re-order level is reached in the warehouse. The activity to re-order goods from the supplier should be initiated.

4.1 Continuous and Discrete Simulators

A system is considered continuous or discrete depending upon how it's attributes change their values. Generally, a continuous system is described by continuous equations that relate the various attributes with time. For example, economic processes in DYNAMO are represented by continuous models that take the form of difference equations. The system attributes are the R.H.S of these equations. On the other hand, the attributes of a discrete system are changed discretely by activities. These activities are triggered as time passes.

4.2 Clock Time

All simulators contain a variable which can be thought of as a clock. The passage of simulated time is represented by incrementing the clock. Each clock increment is called a simulation time unit and abbreviated by STU. The STU corressponds to one actual time unit. For example, one STU may represent one millisecond or, one hour or, one week. The STU is chosen by the user and depends on the characteristics of the system under consideration . The simulator will terminate it's operation when the clock exceeds a specific value. This value is called the ending simulation time and is specified by the user. The clock is called INOW in CYSDEM. INOW is initialized by the user and is updated by the simulator.

The clock is updated in the following manners:

- In continuous simulators such as DYNAMO, the clock is updated when all the difference equations, that describe the system, have been evaluated for the current clock time.
- In discrete simulators the clock is updated when all the events that were scheduled to occur at the current clock time have been triggered and the corressponding activities have been completed. Note that:
  - All values taken by INOW are integers.
  - Activity duration must be expressed in terms of an iteger number of STUs.

Figure 1.4 clarifies the above concepts.

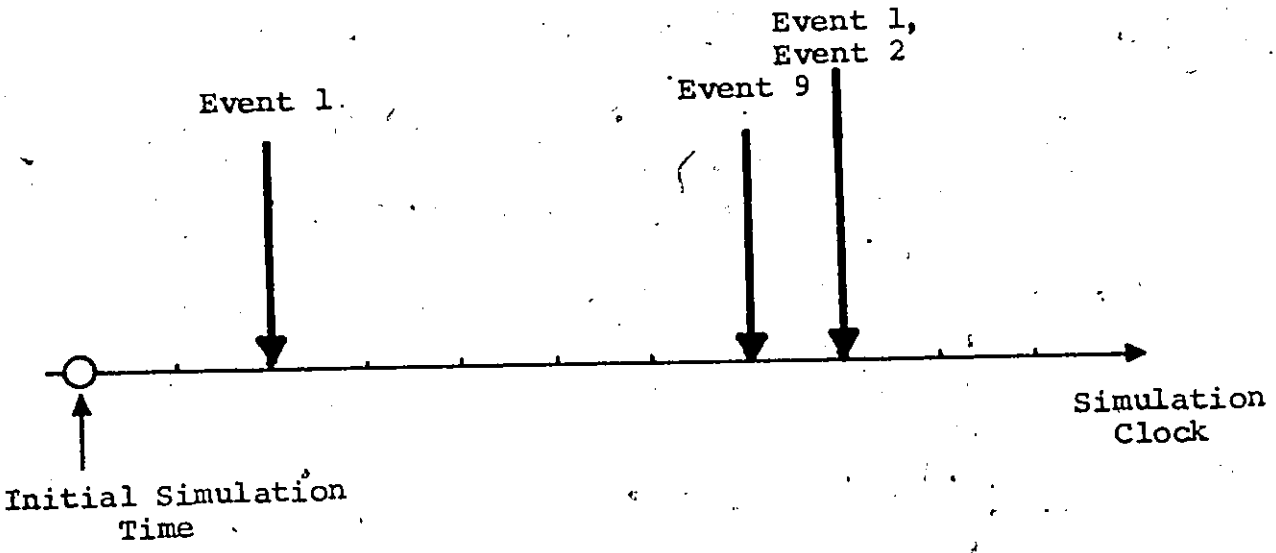


Fig. 1.4.

4.3 Updating The Clock Time

In cotinuous simulations a system is described by a set of equations. All these equations are evaluated at each updating of the clock. The clock is always updated by one simulation time unit. There may be a certain order in which the equations are evaluated,but the fact is that all of them are evaluated after each time increment.

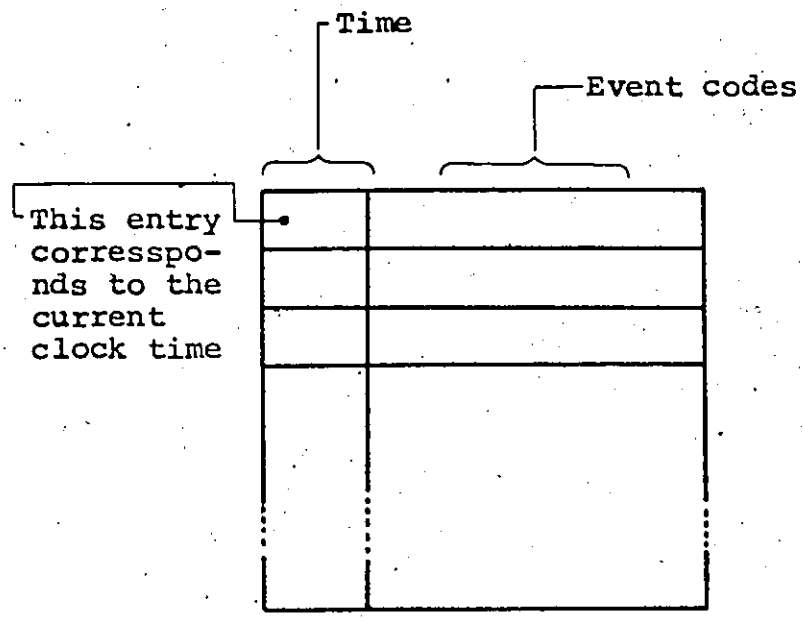
In discrete simulations the situation is different because some events,not all events,occur at the current time,as shown in Figure 1.4. An events list is maintained by the simulator. Each entry in this list contains a time and the codes of the events that were scheduled to occur at that time.These codes are used to trigger the corressponding activities. The event codes may be used to control the sequence of triggering these activities.

Figure 1.5 shows two possible data structures for an events list of a discrete simulator.

Generally,the clock may be updated by either of two methods:

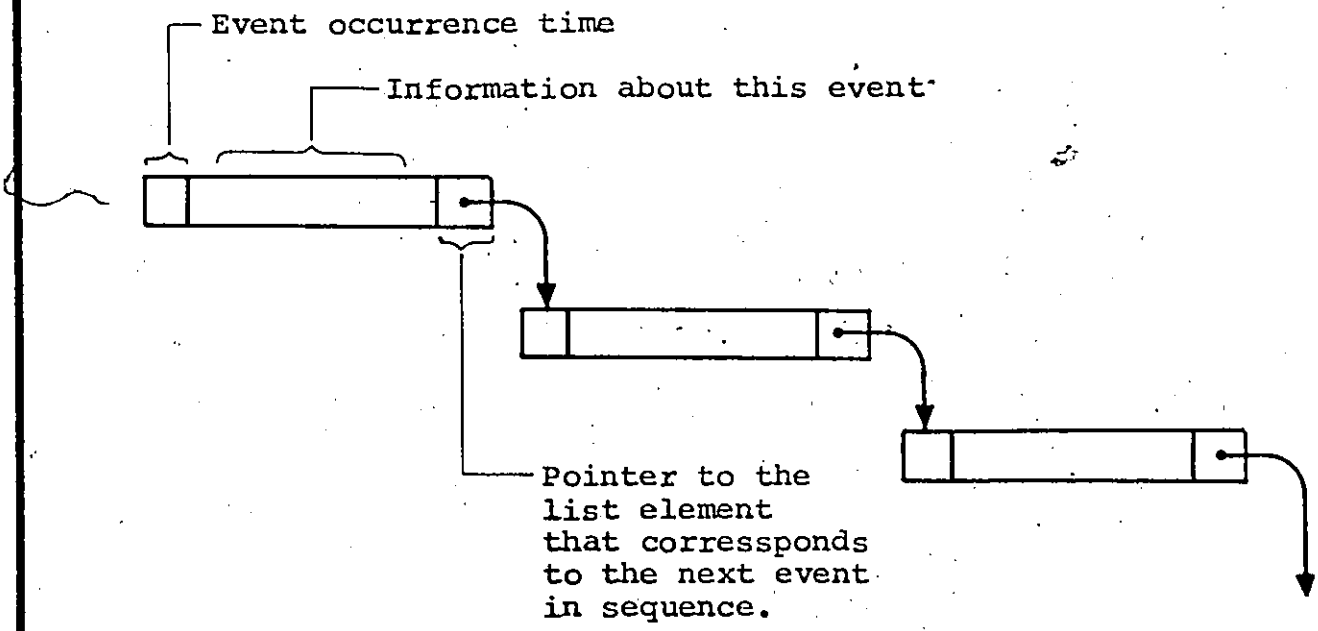
1- Unit Time (Time Slice):

The clock is always updated by a constant number of STUs. After each update the entry that corressponds to the current time is looked-up. If any event codes exist in that entry then,the corressponding activities are triggered.



A matrix, used in GASP and CYSDEM

Fig. 1.5(a)



A linear list, used in SIMSCRIPT

Fig. 1.5(b)

2- Critical Event:

Upon completion of all activities specified for the current time, the clock is forced to the next event time in the events list.

The CYSDEM simulator is a discrete, events list and unit time simulator. The events are inserted in the events list by various methods that will be discussed later. The simulation run is initiated, with some events in the events list. These events trigger activities that cause the insertion of more future events in the events list.

5- Main Features of CYSDEM:

CYSDEM was designed to evaluate CYBERSTRUCTURES of organization units. It's main featuures are:

- CYSDEM is FORTRAN based therefore, it does not need separate compiling facilities since most computers have FORTRAN compilers.
- CYSDEM is extendable to meet the needs of particular applications.
- CYSDEM is based on an easy to learn schematic representation called the CYBERSTRUCTURE. The CYBERSTRUCTURE helps the user to identify and specify the key factors in an information system.

- CYSDEM includes an established set of FORTRAN subroutines that perform the various tasks required to simulate an information system.
- CYSDEM is an open ended simulator. It needs the following as input:
  1- A set of specification sheets on which the user specifies the characteristics of his system.
  2- A set of forms to initialize the system.
  3-A few user written FORTRAN subroutines that when concatenated to the established CYSDEM library produce the complete computer model.

The second chapter explains in detail the elements of the CYBERSTRUCTURE,by using simple examples. The third chapter explains how each of these elements work and their main characteristics. The fourth chapter explains how the CYBERSTRUCTURE is specified to the simulator. This task is performed,using specification sheets. The fifth chapter explains how to build the computer model and how to use the CYSDEM library for that purpose. The sixth chapter is an example. A production-distribution system was used. The system was taken from Forrester's "Industrial Dynamics". The seventh chapter contains the results of the production-distribution system.

CHAPTER 2

THE CYBERSTRUCTURE CONCEPT

1. Introduction:

The objective of this chapter is to introduce the CYBERSTRUCTURE. The CYBERSTRUCTURE is a schematic representation of the organization unit under consideration. It is constructed by the user. It enables the user to:-

1) Identify and interrelate key elements of a system.
2) Determine the sources and flows of data within a system.
3) Describe the system in a suitable manner for the next stage. That is constructing the Computer model.

Using the CYBERSTRUCTURE, the system is defined in terms of data. Changes in the physical states of the system's attributes are represented by changes in data. It is necessary to distinguish between a physical reality, of an attribute, and it's data image. For example, the physical number of units in an inventory bin may be 100 units. However, the data image of the number of units in the bin may be totally different. This difference is caused by possible errors in recording and transmitting the actual value. The behaviour of an organization depends on actual values however, decisions are based on recorded values.

1.1 Example

In order to clarify the main concepts of the CYBERSTRUCTURE, consider the example shown in Figure 2.1.

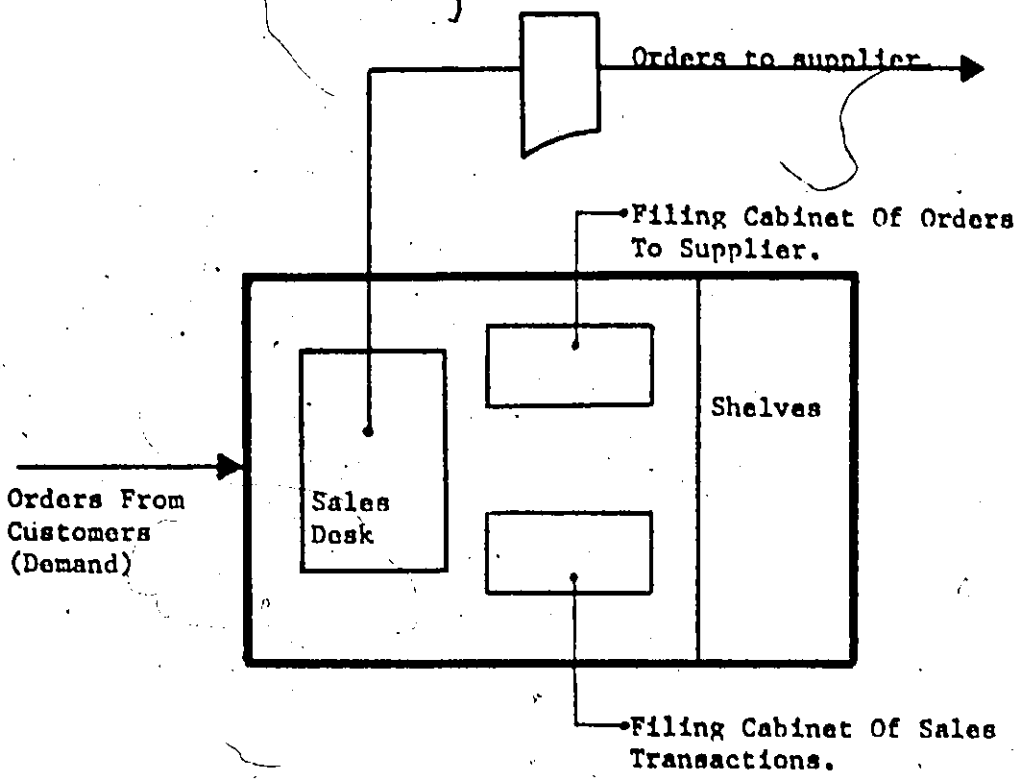


Fig. 2.1

A shop sells a particular type of product to customers that arrive at a sales desk. The shop is manned by one sales clerk that performs the following functions:

- Upon the arrival of a customer, the clerk takes the order (in duplicate copies) by filling in the following information on the order:

Customer's name

Number of units requested

Unit price

Total price

- Picks up the number of units requested from a shelf area, which is right behind him, and gives it to the customer. (i.e., to minimize the delay between filing the order and handing the units requested to the customer).

- A copy of the order is given to the customer as a receipt while the original stays on the sales clerk's desk where it is batched with previous orders until the sales clerk is free to sort the batch and place it in the filing cabinet of sales transactions.

- At the end of the day, the sales clerk fills an order (in duplicate) to the supplier to resupply the shop with fresh units of the product. The amount ordered depends on previous sales history. The original is mailed to the supplier while the copy is filed in a cabinet.

Several factors were dropped in the above system such as:

- checking the re-order level.
- the back-log of customer's unfilled orders.
- the back-log of orders to the supplier.

However, the objective of this example is to clarify the concepts of the CYBERSTRUCTURE, not to actually analyse the system. Two approaches, to simulate this system, will be considered:

1) The first approach is from the manager's point of view, whose concern is about the overall performance of the shop. In this case it may be assumed that the individual orders are aggregated such that the input to the system is the demand during a specific period of time (e.g., the demand during the first working hour of the day is twenty units).

2) The second approach is at the transaction level. Each arriving customer will be considered as a transaction that will wait in a queue until served by the sales clerk. This is too much detail for the manager, however the approach serves by giving insights into the operation of the CYBERSTRUCTURE.

1.1.1 The First Approach

The first step is to consider the demand and how to represent it. Assuming that the system will be simulated for one month, i.e., 22 working days, each working day is 8 hours. Further, assume that a simulation time unit (STU) of one hour is chosen†.

This means that the simulation will stop after

$$22 \times 8 = 176 \text{ simulated hours}$$

i.e., when the current clock time equals 176 STU's.

Since the demand changes during the day, then it can not be assumed that at every value of the current clock time the same value of the demand will be used. Assume that during the working hours the demand is exponentially distributed, as shown in Figure 2.2.

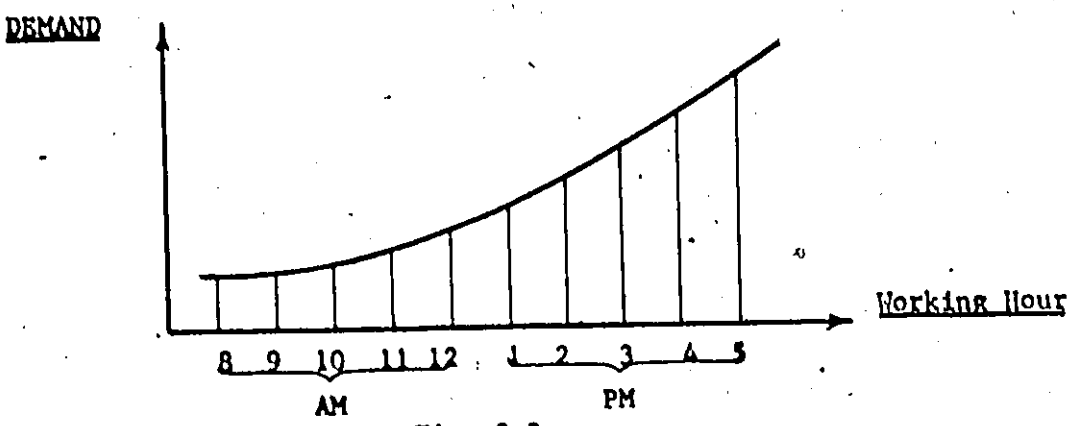
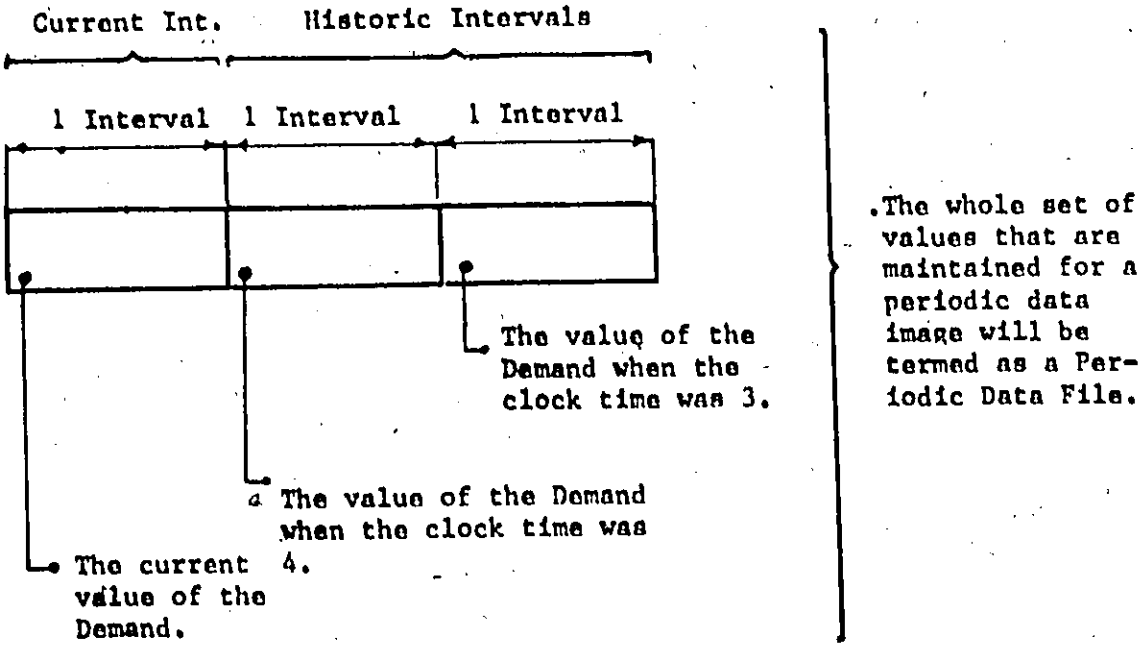


Fig. 2.2

†The choice of the STU depends on the system under consideration. Generally, a small STU will give more accurate results, but will cause a longer computer run time.

This implies that at every updating of the clock, the value (data image) representing the demand must be changed. The duration (in STU's) during which the data image represents the current value is called the period. Therefore, the period of the above data image is one STU because it changes every one STU. Data that changes every specified period will be termed periodic data. It may be desirable to maintain† more than one period (interval) for the demand. Assume that it is required to maintain the latest three values of the demand. Let the current clock time be 5, then the following set of values for the demand should be maintained:



†The values are maintained in an array in memory.

When the clock advances to 6, the values that should be maintained then are:

- the current value
- the first historic value, i.e., when the current time was 5
- the second historic value, i.e., when the current time was 4.

This is done by a 'push down' operation of all the values of the periodic data file and the oldest value is dropped out of the system while the new current value becomes the first.

The periodic data file is represented, in the CYBERSTRUCTURE, using the symbol shown in Figure 2.3.

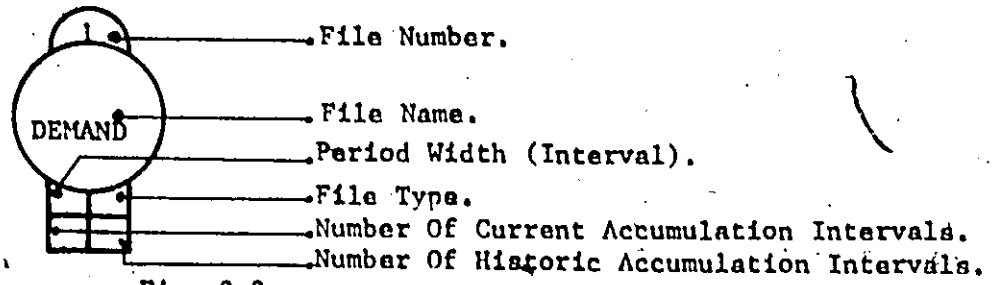


Fig. 2.3

The 'push down' operation occurs because the current clock has moved one STU in time. Therefore a new value for the demand corresponding to the new current clock time must be generated and placed in the most current interval of the periodic data file. This new value is generated by an activity that occurs after each updating of the clock.

This activity is not within the system boundary (the shop) and therefore will be termed environmental activity. Since the demand changes every one STU, then the activity should be triggered every one STU to generate the new demand.

An activity is connected to a periodic data file via an information data link. Its function is to transfer data between activities and periodic data files. As will be shown later, the data links may effect the data during the transfer operation.

At this stage, the CYBERSTRUCTURE may be drawn as in Figure 2.4:

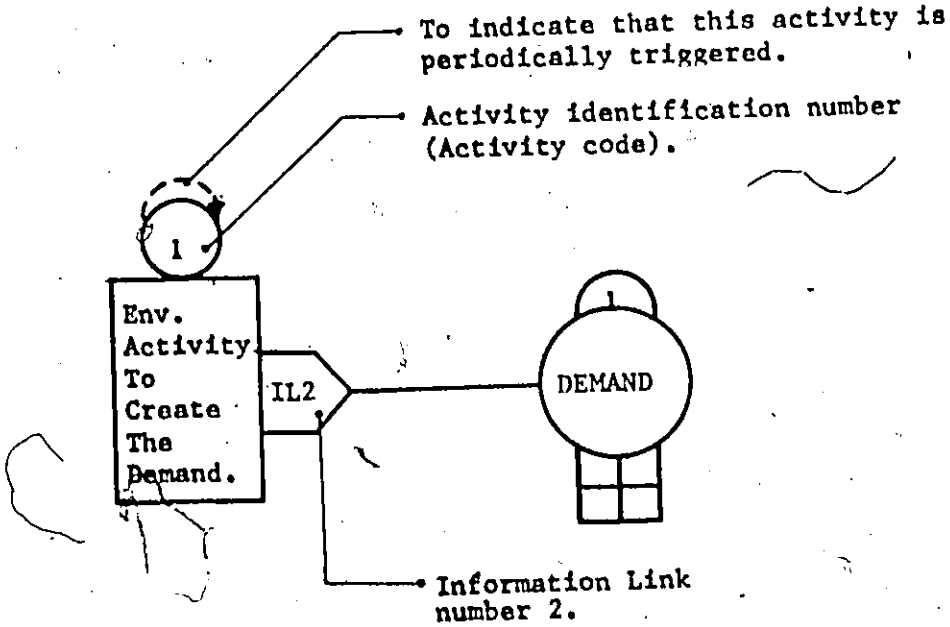


Fig. 2.4

The next step is to consider what happens as a result of the demand. As a result of this demand, the sales clerk performs the following activities:

1) Fill the order in duplicate.
2) Get the required number of units from the shelf.
3) Hand the units to the customer, with a copy of the order.
4) Batch the other copy of the order with previous copies.

How the above activities are represented depends on how much detail is involved in the CYBERSTRUCTURE current purpose, it may be assumed that there is one activity called 'satisfying the demand' which performs the above four functions. The results of this activity are:

1) The amount of inventory on hand would be reduced by the amount of the demand.
2) At the end of the day, an order transaction will be mailed to the supplier.

The value of the inventory on hand will be updated periodically, i.e., every time the activity is triggered. The inventory falls under the periodic data class and the values of the inventory (current and historic) will be stored in a periodic data file.

Obviously, the 'satisfying the demand' activity will be triggered every time a new value of the demand is created

by the environmental activity. Such a method of triggering is called externally triggered because the associated activity is triggered by an external event, that is an updating of the value of the demand.

The duration of the 'satisfying the demand' activity is the time in STU's that is required by the sales clerk to satisfy the current demand. Since the demand increases exponentially during a working day, then the service time (activity duration) required by the sales clerk increases exponentially as well. It shall be assumed that the duration has a mean of one STU.

The other result of the above activity is that an order transaction is issued to the supplier at the end of the day. Therefore, every time the activity is triggered, it must check† if the current clock time corresponds to an end of a working day. If it does, then the order transaction is issued.

The order transaction is created by the 'satisfying the demand' activity. The transaction is sent to the supplier, who in turn ships the required units to the shop and the order transaction is of no importance to the system

†The activity is represented in CYSDEM by a FORTRAN subroutine segment, therefore the check is easily performed.

(shop) any more. This gives rise to another subclass of data, that is transaction data, this data comes and passes out of existence with respect to the system. Transaction data moves through the system along a predefined path called the transaction string†. The transaction goes out of existence after being processed by the last activity on the transaction string, in our case it is the 'supplier' activity. Just like periodic data, transaction data is input to and, output from, an activity through transaction data links.

There is a mail delay between the issuing of the order transaction and receiving it at the 'supplier' activity. Therefore, the transaction data link connecting the 'satisfying the demand' activity and the transaction has a lag time. Also there may be more than one order transaction at the supplier waiting to be processed by the 'supplier' activity. Those orders wait in a transaction queue.

The last activity in the system is the 'supplier' activity. It is an environmental activity because the supplier is outside the system boundaries. This activity is externally triggered by an arrival of the order transaction from the shop. The duration of this activity is the time required to process the transaction order and actually ship

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†The transaction data will be discussed in more detail when explaining the second approach.

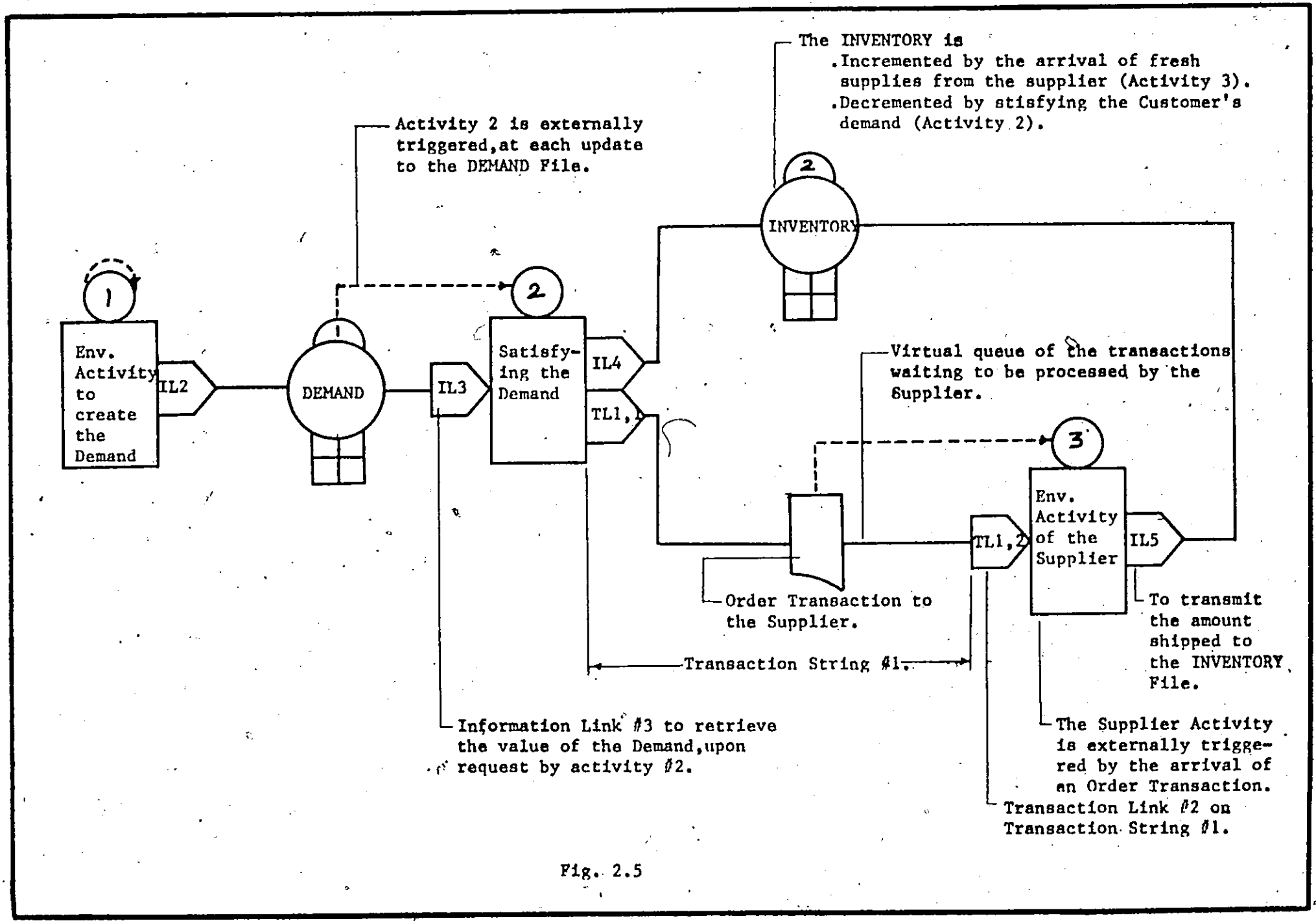
The INVENTORY is
.Incremented by the arrival of fresh supplies from the supplier (Activity 3).
.Decremented by stisfying the Customer's demand (Activity 2).
Activity 2 is externally triggered,at each update to the DEMAND File.
2
INVENTORY
1
Env. Activity to create the Demand
IL2
DEMAND
IL3
2
Satisfy-ing the Demand
IL4
TL1,2
Virtual queue of the transactions waiting to be processed by the Supplier.
3
Env. Activity of the Supplier
TL1,2
IL5
Order Transaction to the Supplier.
To transmit the amount shipped to the INVENTORY File.
Transaction String #1.
Information Link #3 to retrieve the value of the Demand,upon request by activity #2.
The Supplier Activity is externally triggered by the arrival of an Order Transaction.
Transaction Link #2 on Transaction String #1.

Fig. 2.5

the requested units to the shop, it shall be assumed 4 STU's. The effect of receiving the units at the shop will be felt after the delay of the shipping process. Figure 2.5 shows the complete CYBERSTRUCTURE using the first approach.

1.1.2 The Second Approach

The following are the steps by which the CYBERSTRUCTURE was obtained using the second approach:

1) Each order from the customer is considered as a transaction. This transaction is created by an environmental activity. This activity is triggered once for every arrival of a customer. The customer interarrival time is not deterministic, but is exponentially distributed like the demand of the first approach. Therefore, the activity is triggered in a random fashion and according to an exponential distribution. This is called a randomly triggered activity. The activity places the transaction on transaction string 1, via transaction data link (1,1). The first number in the transaction data link is the string number while the second is the link serial number on the string.

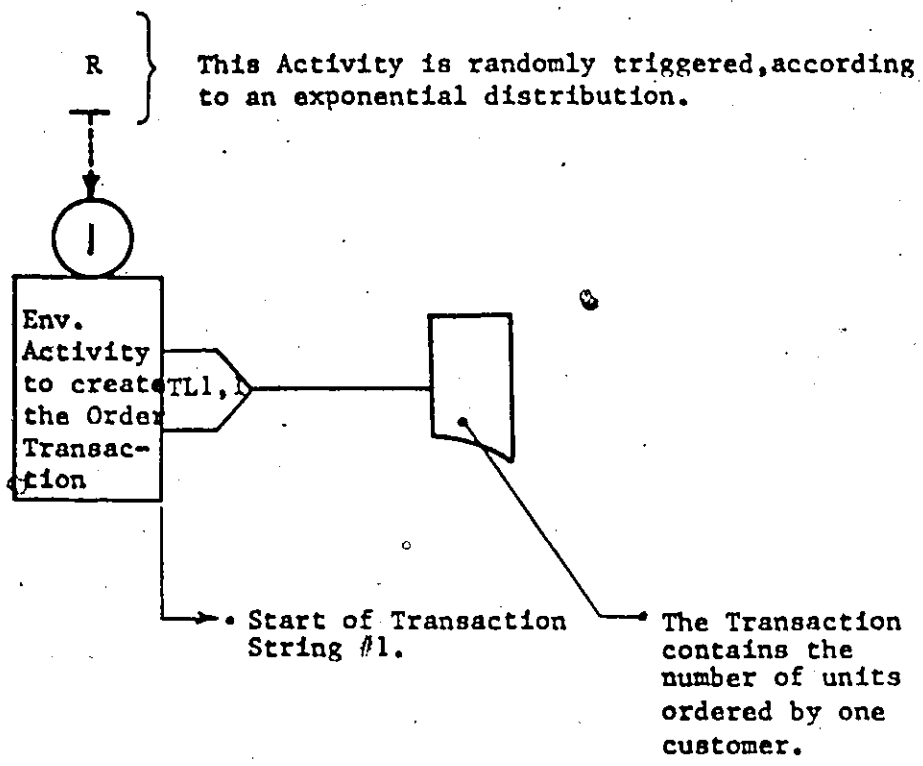

Fig. 2.6

2) The arrival of the transaction at the shop will cause two activities to be taken on behalf of the sales clerk:
   - filling out the order in duplicate
   - going to the shelf area with the original copy of the order and handing the goods, as well as the copy of the order to the customer, who in turn leaves the system.

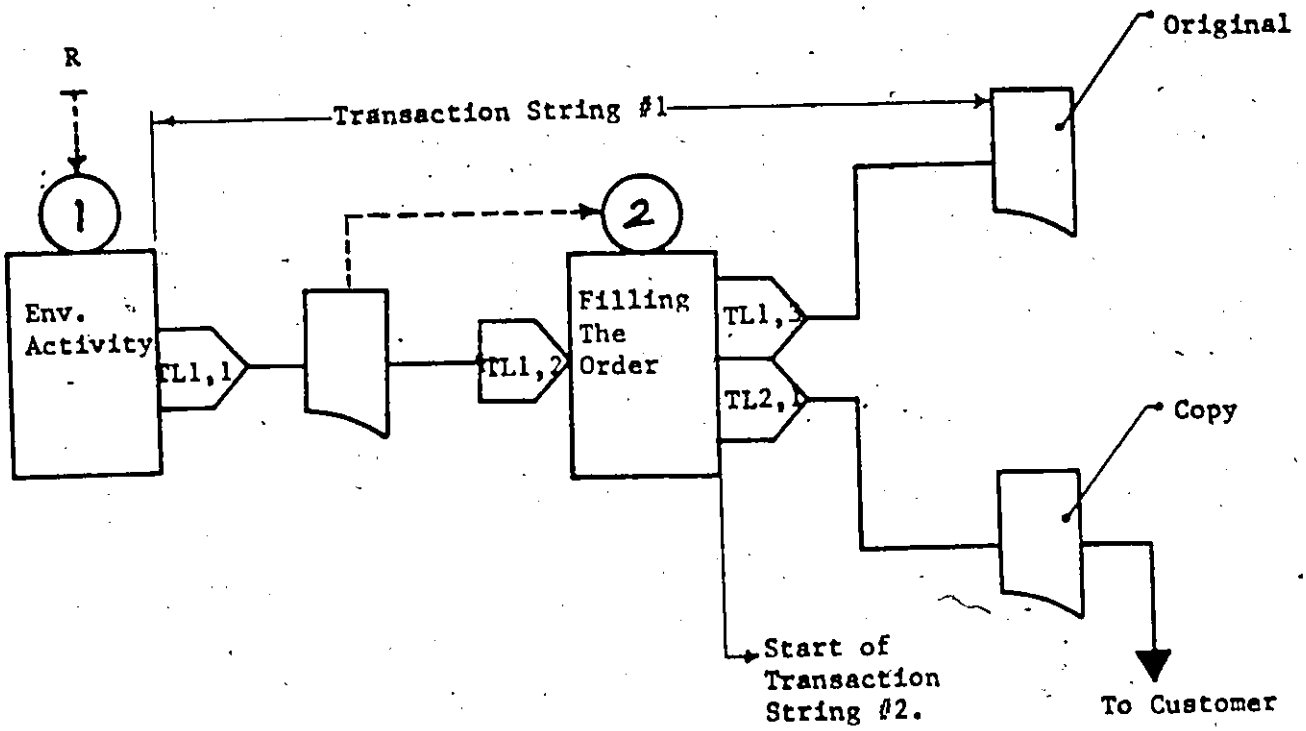

Fig. 2.7

Since the copy remains on the sales clerk's desk until handed to the customer, it does not effect the performance of the system and there is no need to define a transaction string for this copy.

3) After filling the order, the sales clerk hands the goods to the customer. These goods are taken from the existing inventory which is represented as a periodic data file. The original copy of the order is batched with the previous orders until the end of the day to be

processed by the reorder activity. This activity processes the transactions waiting in the queue in front of the reorder activity, via transaction link (1,6).

4) The reorder activity is the last activity to process the order, therefore transaction string 1 ends with the activity. The output of this activity is another transaction to the supplier. This starts a new transaction string (3).

5) The supplier activity is exactly the same as that of the first approach.

The CYBERSTRUCTURE is shown in Figure 2.8. Sometimes it is required to measure some characteristics of the transaction string, for example, the transaction transit time through a transaction string. Such measures are called transaction parameters. Therefore, there are two types of attributes associated with a transaction:

- Parameter attributes to help measure the system performance.
- Value attributes that are physically recorded on the transaction. For example, the number of units requested, customer name, etc.

It is to be noticed that all the activities, except activity 1 which originates the order, are triggered by transactions. A model that behaves in that manner is

called transaction-oriented[†].

2. The Elements of the CYBERSTRUCTURE

The previous section provided the reader with an initial orientation towards the CYBERSTRUCTURE concept. The elements of the CYBERSTRUCTURE will be explained in this section. The following section explains in complete detail the characteristics and the operation of these elements.

The main elements of the CYBERSTRUCTURE are:

- Data sets
- Processes
- Data Links

The following is an explanation of these elements, at the CYBERSTRUCTURE level.

2.1 Data

The data that is of interest within the CYBERSTRUCTURE framework is that which records the value of a physical attribute of an entity within the system.

There are two types of data:

- Periodic data
- Transaction data

[†]Like a GPSS block diagram where all blocks remain idle until entered (activated) by a transaction.

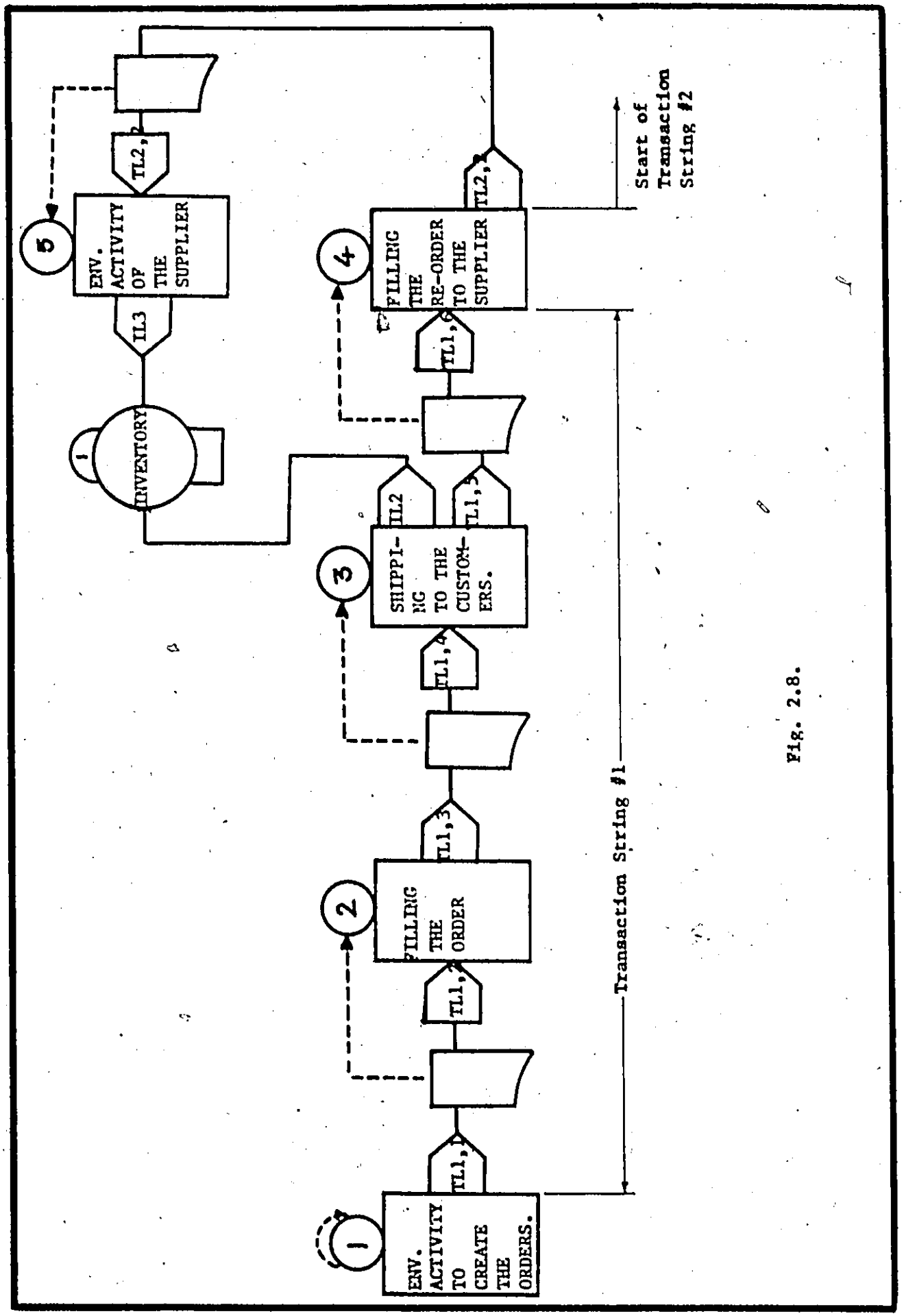
ENV. ACTIVITY TO CREATE THE ORDERS.
FILLING THE ORDER
SHIPPI- NG TO THE CUSTOM- ERS.
FILLING THE RE-ORDER TO THE SUPPLIER
ENV. ACTIVITY OF THE SUPPLIER
INVENTORY
TL1,1
TL1,2
TL1,3
TL1,4
TL1,5
TL1,6
TL2,1
TL2,2
TL2
TL3
Transaction String #1
Start of Transaction String #2

Fig. 2.8.

2.1.1 Periodic Data

A periodic data file contains a set of data images of a physical attribute. Each component of the set represents the physical state of the attribute during an interval of time, called the period width. Fresh data images are inserted in the file as time advances while the old data images are dropped, as previously explained in the shop example. The periodic data file is characterized at the CYBERSTRUCTURE level by the following four parameters:

1) The Period Width in STU's.
2) The File Type:- In the shop example (the first approach), there were two periodic data files. The DEMAND and the INVENTORY. The new value of the demand was created by the environmental activity. This activity was triggered every one STU to create a new value for the DEMAND file, which in turn had a period width of one STU[†], i.e., there is only one value posted to the interval during a period. However, if the period width was two STU's, then the activity would post two values to the interval. The file type indicates the method of obtaining the data-image to be maintained in the interval in case

---

[†]Note that as the period width increases, the probability that the data image matches the physical value decreases.

more than one value was posted to this interval. In case the environmental activity is triggered twice during the interval, then the data image would be the sum of the two posted values. However, other cases may exist where the data image is the smallest or the largest or the mean of all values posted to the same interval. Table 2.1 explains the six different file types.

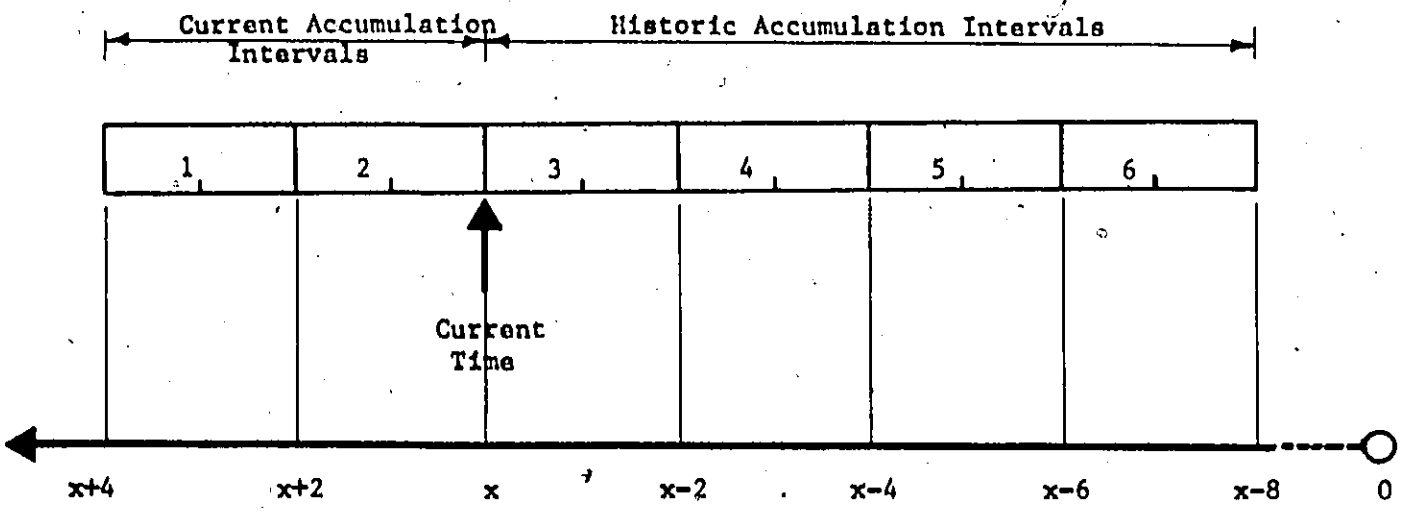

Fig. 2.9

FILE TYPE	EXPLAINATION AND REMARKS
1	More than one value is posted to the current interval. The stored data image will be,the largest of these posted values.
2	Like the above,except that,the stored data image will be the smallest,of the posted values.
3	The data image is the sum of all the posted values.
4	This type is called 'a double entry file'. That is because,each data image,is represented by two values. The first,is the mean of all the posted values. While the second,is the standard deviation, of all values posted to this interval. However,that is true only if the interval has become a historic interval. If the interval is still current,then the sum and the square of the sum,of all posted values,are stored,instead of the mean and the standard deviation.
5	Each new posting,replaces the older data image in the interval. Therefore,the most recent value is maintained in the interval.
6	This is called 'a level file'. Each posting,is either added,or subtracted,from the data image in the interval,depending on the sign of the value posted. When the push-down operation occurs,the new current interval,that is appended to the beginning of the file,takes the value that is in the preceeding interval. Therefore,each interval will contain the algebric summation of the data image in the preceeding interval and all the values posted to the interval under consideration. The INVENTORY file is an example because,the new inventory level is equal to the older level + supplies from the supplier - shippments to the customers.

Table 2.1

3) Number of CAI's:- This means the number of current accumulation intervals. The following explains why there may be a need for more than one CAI. Assume the current clock is x and the file period width is 2 STU's. Assume that an activity, that posts a value to the above file, was triggered at time x. If the duration of the activity was 2 STU's, then the output value to be posted to the file would be available at time x+2. Therefore it has to be posted one interval ahead of the current interval, i.e., posted to interval 1, not 2. Figure 2.9 shows the file.

4) Number of HAI's:- This means the number of historic accumulation intervals that should be maintained for historical purposes. If only the most recent data image is required by all activities that use this file, then only one HAI is required. However, it will be shown later, that the number of HAIs, is a function of the lags of the data links that retrieve values from the file.

2.1.2 Transaction Data

Transaction data is associated with entities that are generated and destroyed with respect to the system. Each transaction data set may contain several attributes. For example, the order transaction to the supplier in the

shop example, could contain the following attributes:

- Name of the shop
- Address of the shop
- Number of units requested

Furthermore, the transaction data set may contain some parameters, which are defined by the user, to measure the system performance. An example of a parameter is the transit time of the transaction data set. The major distinction between periodic and transaction data is that transaction data moves on a predefined transacting string. Therefore, a transaction data set is available to a requesting process, only if it has arrived there. The transactions,waiting to be processed by a process,form a queue in front of the process. On the other hand, periodic data is always available. The following are the characteristics of a transaction data set, at the CYBERSTRUCTURE level:-

1) The String Number:- This is the number of the transaction string which this transaction data set follows as it moves.

2) Current Location on String:- Each string contains a serial sequence of activities that process the transaction data set. A queue exists in front of each activity on the string. The data set initially is generated by an activity then placed on the first queue of the first activity on the

string. After the data set is processed by that activity, it moves to the second queue.

The current location of the data set is the queue number on which the data set is waiting to be processed.

3) The Number of Attributes V:- This is the number of attributes on the transaction data set.

4) The Number of Parameters P:- This is the number of parameters associated with the transaction data set.

5) The Maximum Queue Length:- This is the maximum number of transactions permitted to wait in a particular queue. Different queues on the same string may have different maximum queue lengths.

The transaction data set is represented by the following symbol:

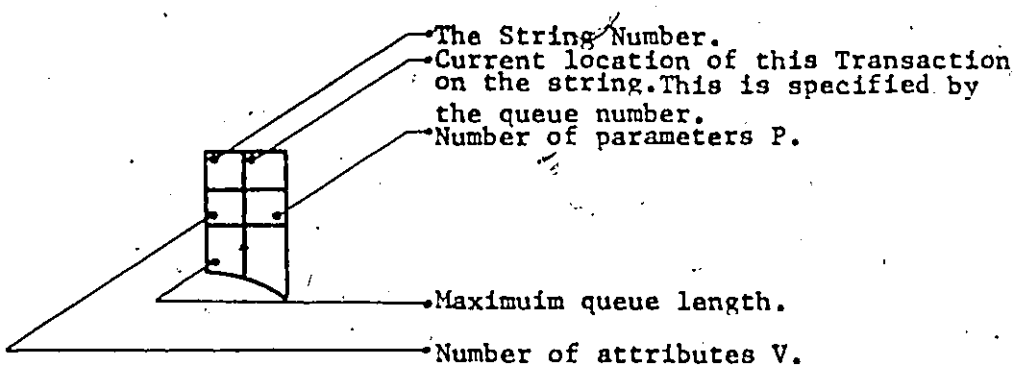

Fig. 2.10

2.2 Processes

A process is defined as an operation which accepts data as input and transforms it into an outcome that can be described in terms of data.

For example, a production process could be described in terms of changes in data. The outcome of the production process will be an increase in the inventory level file and a reduction in the raw materialss level file.

Sometimes a process can not be described in terms of data. In this case, this process should be defined as a sub-process of a larger process that satisfies the above definition:

There are two types of processes:

- The activity
- The link process

2.2.1 The Activity

The activity process is characterized at the CYBERSTRUCTURE level by:

1) The method of triggering
2) The duration
3) The method of description

2.2.1.1 The Method of Triggering

There are four basic methods of triggering, as shown in Figure 2.11.

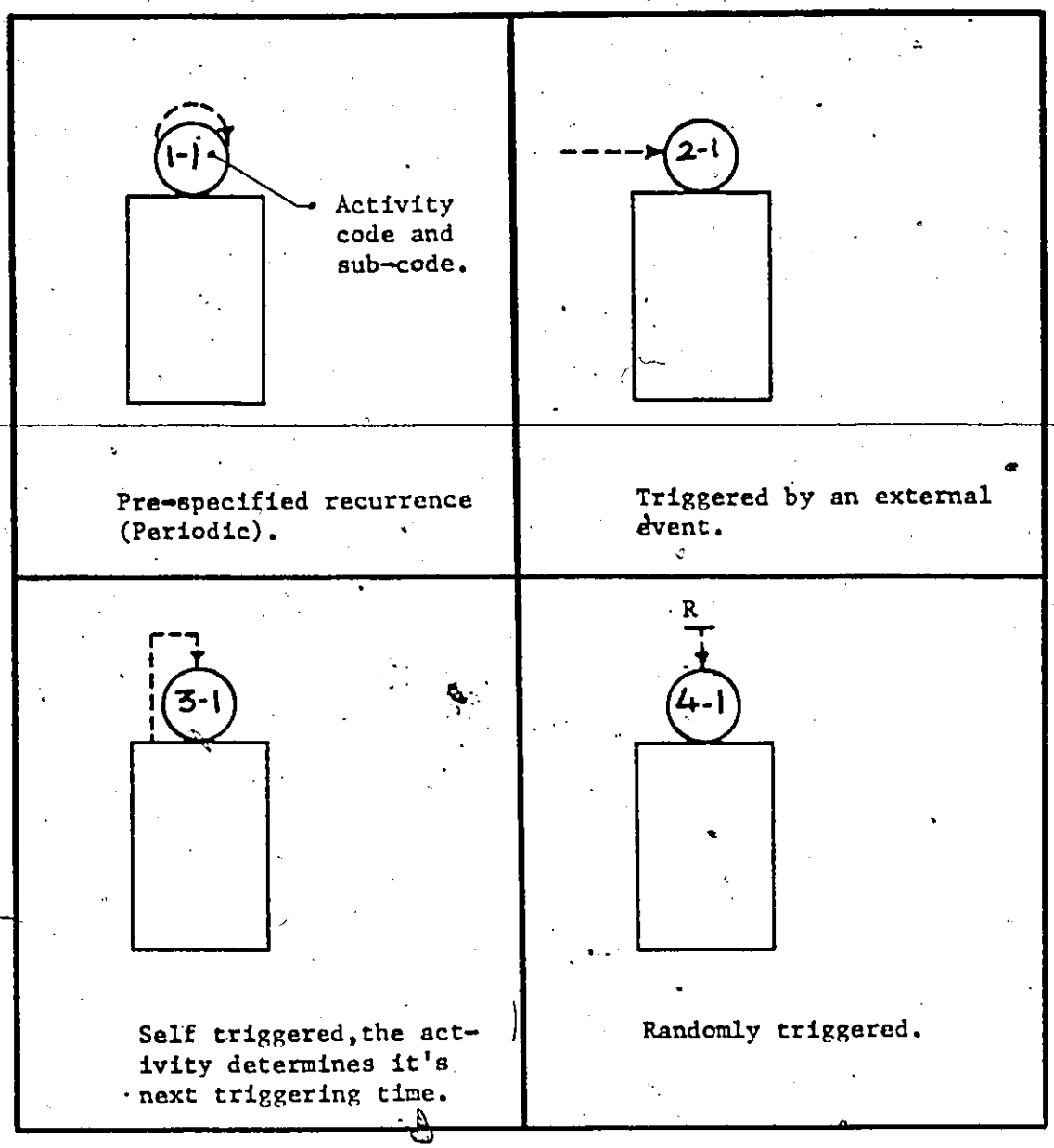

Fig. 2.11

The triggering method selected by the user depends on the nature of how the activity is initiated. For example, if a warehouse manager sends a re-order note to the supplier once every week, then the re-order activity and its associated sub-activities, if any, would be triggered every week, i.e., a pre-specified period. On the other

hand, if the note is sent whenever the re-order limit of a specific item in the warehouse is reached, then the re-order activity must be triggered every time there is a draw down from the inventory to check if the limit is reached, i.e., externally triggered by an event. Generally, an activity may be triggered by any combination of the four basic methods of triggering. For example, the re-order activity may be triggered once every week, as well as every time the re-order limit is reached.

When an activity schedules the next time it is going to be triggered, then it is called a self-triggered activity.

When the exact time of triggering an activity is not known exactly, but the time intervals between each two triggering operations is composed of a deterministic value, superimposed on a stochastic value, then random triggering is used. For example, a manager requests some report every 100 ± 10 STU's. Assuming normality†, then the managerial activity would be triggered randomly. The inter-occurrence time is represented by a normal distribution with a mean of 100, as shown in Figure 2.12.

†The CYSDEM simulator allows most of the statistical distributions to be specified, as well as any user defined distribution.

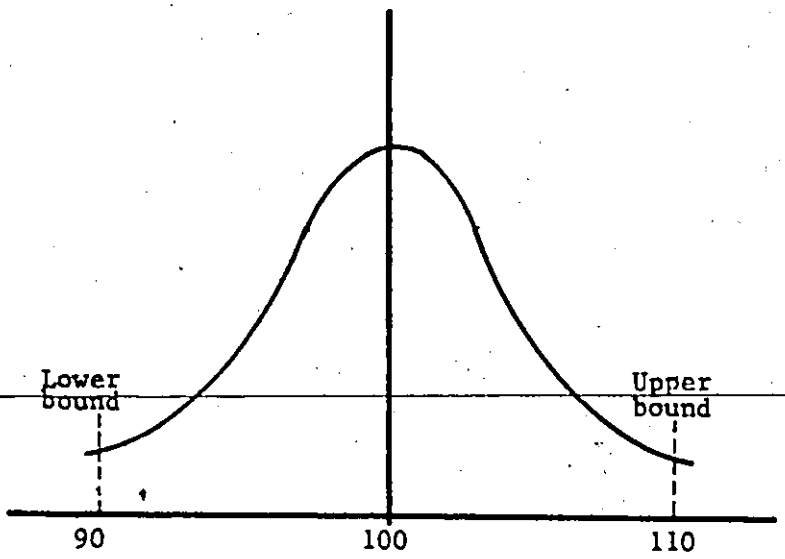

Fig. 2.12.

2.2.1.2 The Duration of an Activity

The duration time of an activity, in STU's, is the time required by the activity to generate it's output data images. This duration must be prespecified by the user[†]. The general form of the duration is:

Constant Component + Stochastic Component

Any of the two components may have a value of zero.

2.2.1.3 The Method of Description

Each activity is represented within the simulator by a segment of FORTRAN coding[††]. The segment, corresponding to a particular activity, is identified by the activity

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[†]Actually, the duration is saved as a variable within the simulator. Therefore, it may be adjusted during the run, but this should be done with extreme care and avoided if possible.

[††]As permitted by the current version of the simulator. However the theory suggests that a process may be represented by other means, e.g.,decision tables, markov chains, etc.

code (identification number). Sometimes it may be desirable to divide the activity. This gives rise to the activity sub-code, which references a particular division of the activity.

2.2.2 The Link Process

A link process is embodied within a data link. It is a process which occurs as a consequence of initiating the link. The following example explains this concept:

A warehouse manager requires inventory information on a weekly basis. A staff process is required to prepare the information for the manager (managerial process). Each of the two processes may be represented as an activity. The staff activity is triggered every week to produce the information as a transaction which triggers the managerial activity as shown:

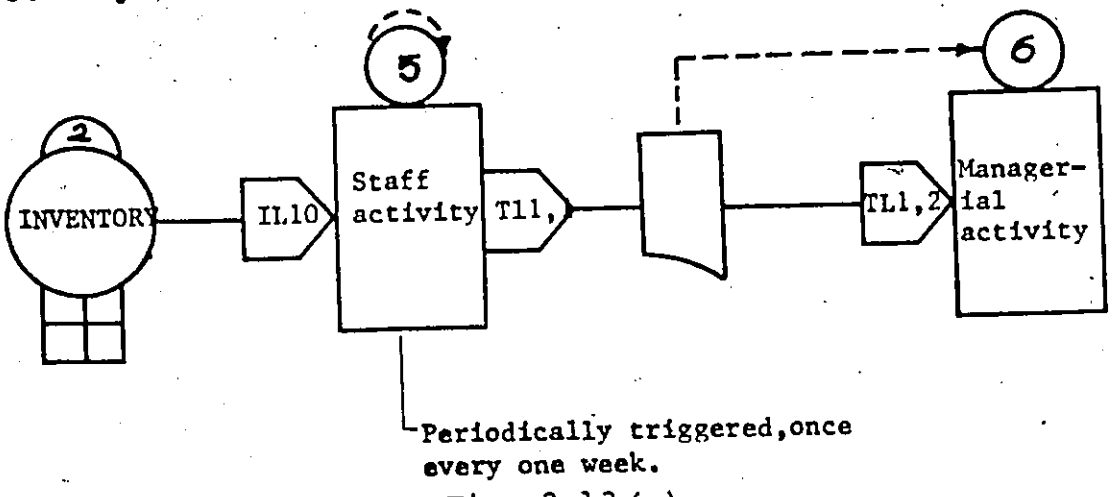


Fig. 2.13 (a)

The staff activity could have been represented as a link process within the information link connecting the

inventory to the managerial activity, as shown in Figure 2.13.

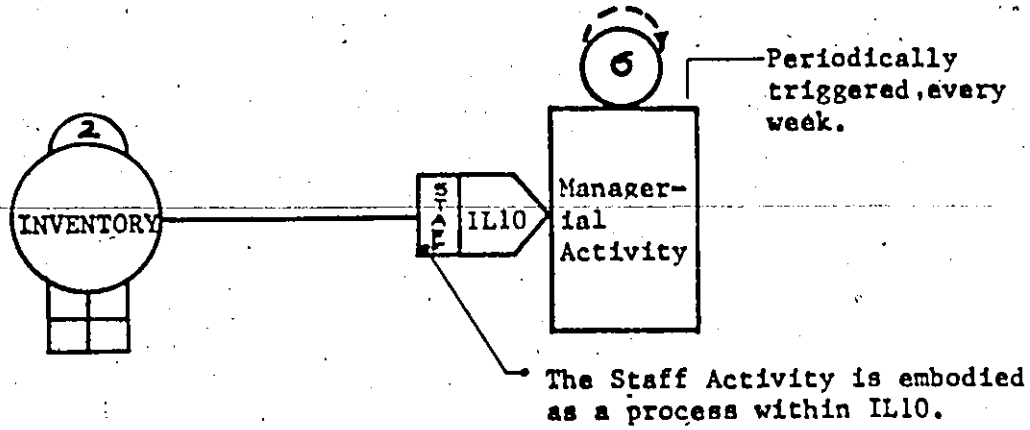


Fig. 2.13

Every time the managerial activity is triggered, IL10 will be initiated, in turn the staff process will be initiated. The information requested by the managerial activity will be available after the delay caused by IL10. This delay is partially caused by the duration of the staff process.

Whether to represent a process as an activity or a link process depends on whether the process is to be activated independently or only when the data link is initiated.

2.3 Data Links

Data links are the linkages between the data and the processes and vice versa. There are two types of data links. Information links which link periodic data and processes and transaction links that link transaction data and

processes. Basically, the two types perform the same functions.

Data links are activated by processes. When a process is triggered it activates its input data links to retrieve the data requested by the process. These links are called retrieval data links. The process performs the necessary data transformation on the input data, generating the output data images. The process then activates its output data links to store the output data images on the appropriate periodic data files or transaction data sets. These links are called storage data links.

The data links may effect the data transfered during the storage and retrieval operations in any combination of the following manners:

1) A lag time (in STU's) is associated with each data link. This lag causes a delay in making the data available for the system.

2) The data passing through the link may be subject to distortion. Distortion may occur due to errors, inaccuracy and human bias which effect the true value of an attribute, resulting in a value that is deviated from the true value. This deviated value will be termed the recorded value. The recorded value, not

the true value, is the basis of making decisions in an organization. However, the actual performance of the organization depends on the true value. The distortion, at the CYBERSTRUCTURE level, may be described as:

(a) A process during the link operation, i.e., a link process. This process acts on the value transmitted through the link, producing the recorded value.

(b) A set of garbling specifications. The resulting recorded value is obtained from true value and a stochastic value. The stochastic value is obtained from a statistical distribution which is specified by the user through the garbling specifications of the data link.

In conclusion, each data image stored in an interval of a periodic data file or, in a value of a transaction data set, is represented by two values. These two values are the true value and the recorded value. The true value is the actual outcome of a process. The recorded value is the result of distortions, to which the true value is subjected to, during the transmission of the true value through data links. The distortion is a characteristic of the data link that is used for transmission. Table 2.2 shows the possible distortion types.

DISTORTION TYPE	REPRESENTATION	RESULT
Garbling		Recorded Value= True Value + stochastic component.
Link Process (May be used for other purposes).		The Recorded Value is determined by the Link Process.
No Distortion specified.		Recorded Value = True Value

Table 2.2

The above discussion shows that the actions of processes are not based on the current and true values of the system attributes, but on the recorded values which can be out-of-date and inaccurate due to the lag and the distortion, respectively, of the data links.

The major characteristics of data links are:

1) The direction (input or output with respect to the activity).
2) The lag time.
3) The type of distortions, if any.
4) The associated link process, if any.

Fig. 2.15.

COMPONENTS OF THE CYBERSTRUCTURE

DATA SETS

Data images that record the result of an activity or the value of an attribute of a physical entity

PERIODIC DATA

Data images of permanent entities. Centerally maintained and can be requested by any process. Attributes:
- Period width.
- No. of CAIs.
- No. of HAIs.
- File type.

TRANSACTION DATA

Data images of temporary entities. Available to a process, only if it is waiting in the queue associated with that process. Attributes:-
- No. of parameters
- No. of values.
- String No.
- Current location.

PROCESSES

A Process accepts only data as input and transforms this input data to output.

ACTIVITY

May be initiated by one or a combination of four methods. Attributes:-
- Triggering method
- Duration, may be fixed or random.

LINK PROCESS

The data transformation occurs within an information link. It can be initiated only if the link is initiated.

DATA LINKS

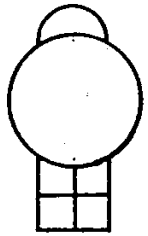
Explicit establishement of a linkage between an activity and it's input and output data sets. Major attributes:-
- Direction w.r.t the activity.
- The Link lag time.
- The associated Link Process.
- Distortion, if any.

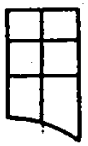
INFORMATION LINK

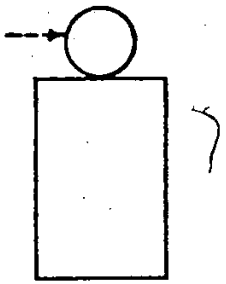
Links Processes with Periodic Data Files. May contain a Link Process. Designated by any number that is greater than one.

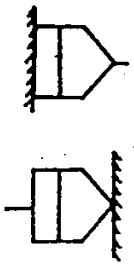
TRANSACTION LINK

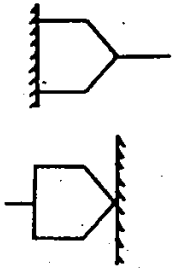
Links Activities with Transaction Data Sets. May not embody a Link Process. Designated by two numbers, the String No. and the Link No.

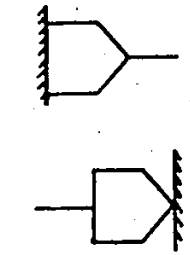












CHAPTER 3
THE INTERNAL ASPECTS OF THE CYBERSTRUCTURE

The CYBERSTRUCTURE of a particular organizational unit is specified to the CYSDEM simulator via specification sheets that are processed by the simulator. To specify the CYBERSTRUCTURE efficiently, the user should get a general understanding of how CYSDEM simulates the CYBERSTRUCTURE. This section explains the main logic behind the internal operation of the elements of the CYBERSTRUCTURE.

1. Periodic Data Files

The previous chapter explained that two values must be maintained in each interval of the file. Those are, the true value and the recorded value. In addition, a third value, the interval access time, is stored.

1.1 The Interval Access Time

The interval access time is the clock time at which the value in the interval may be retrieved by other processes of the system, i.e., becomes available to the system.

Upon the termination of a process, the output storage data links are initiated to store the generated output in the data set. Each data link may have a certain lag. Because of this lag, the output is not instantaneously available to other processes. The access time is:

process initiation time + process duration + storage data link lag

clock time when process terminates

1.2 The Interval Time

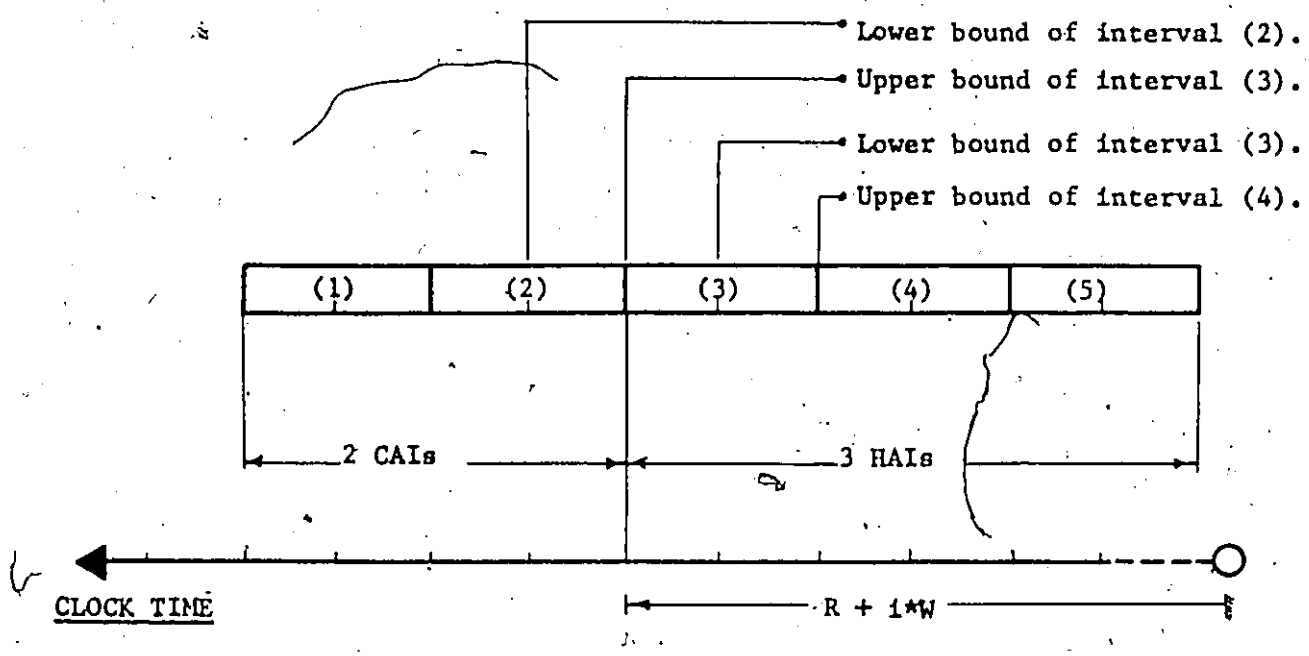


Fig. 3.1.

The constant integer R is defined initially by the user. It is the upper bound of the most recent HAI (interval 3 in Figure 3.1), when the run had started. The upper and lower interval bounds throughout the run are calculated relative to R, as shown in Figure 3.1.

During any time of the run, the upper bound of the most recent HAI will be:

$$R + \underbrace{\frac{t}{w}}_{\text{integer division}} * w$$

where w = period width t = number of STU's elapsed since the run started

The interval time of any interval is its upper bound. When the current clock exceeds the upper bound of the oldest CAI, the push down operation occurs and the oldest CAI becomes the most recent HAI. The push down operation is shown in Figure 3.2, using a periodic data file with an interval width of 2 STU's.

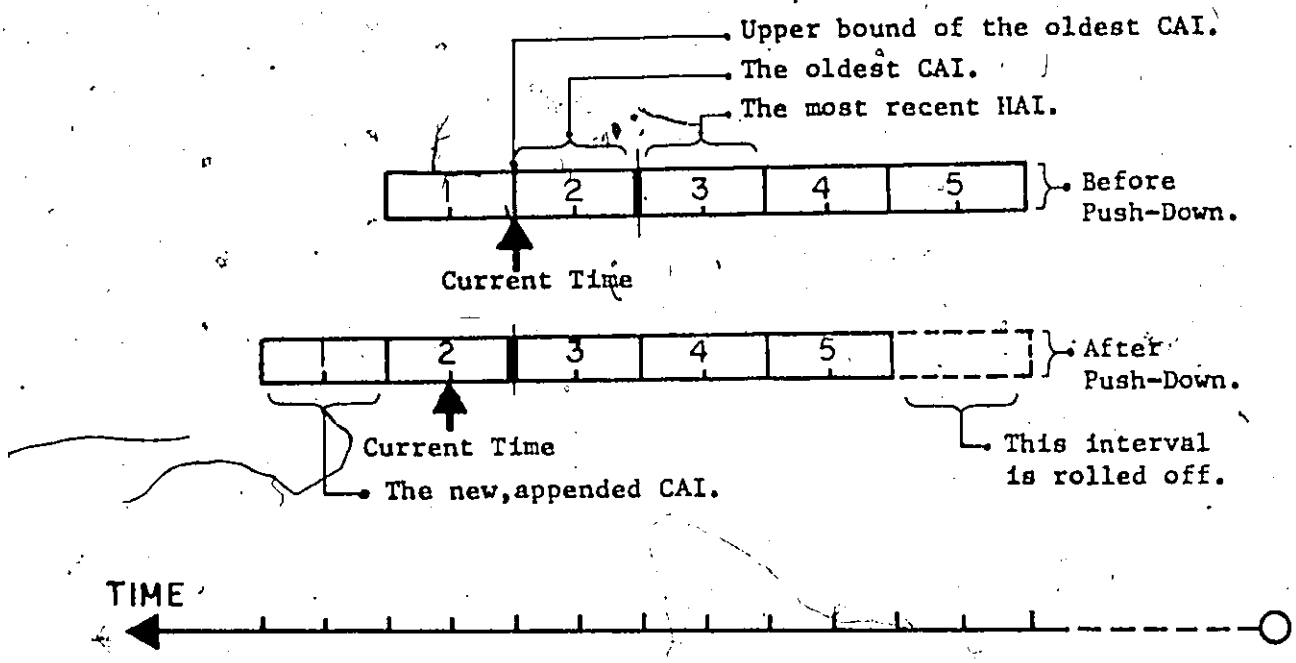


Fig.3.2

1.3 The Data Structure of Periodic Data Files

Each interval in a periodic data file will have the following entries:

True Value	Recorded Value
Access Time	

+ {An implicit value, the interval time}

A periodic data file is represented in CYSDEM by an array data structure, as shown in Figure 3.3.

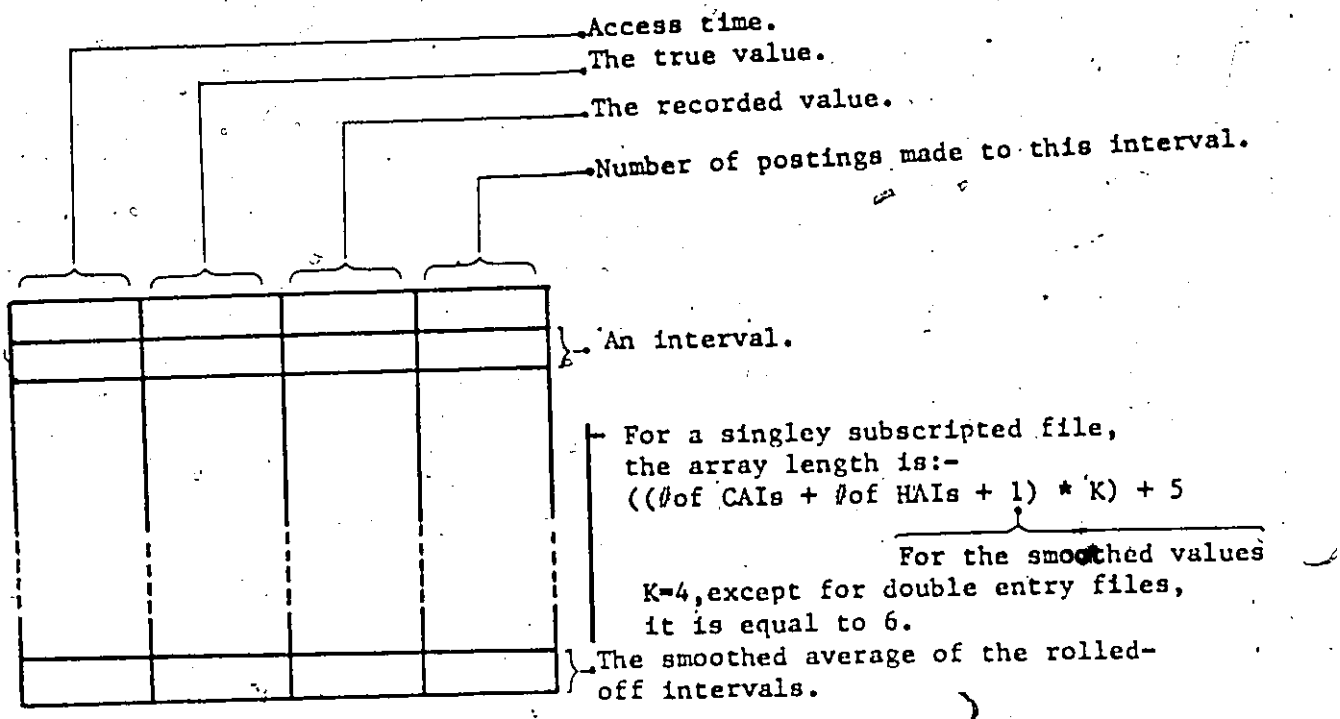


Fig. 3.3

A periodic data file may have up to three subscripts. The first subscript refers to the major interval, as explained previously. The second and third subscripts are used to contain minor intervals of the major interval. For example, the second subscript may contain the sales by district, while the third subscript is the sales by salesman.

2. Information Data Links

When a process is initiated the following sequence occurs during the duration of the process:

1) Retrieval (input) data links are initiated to retrieve the requested input from the data elements.

2) The input is processed to produce the output values.

3) Storage (output) data links are initiated to post the output values to the appropriate data elements.

The first and third points are a function of the data links and are discussed in the following subsections with some other aspects of data storage and retrieval.

1.2.1 Retrieval from Periodic Data Files

A process, with delay D was initiated at clock time T.

There are i input information data links, each of lag L_i. Each of the i input values are retrieved in the following manner:

1) The link is initiated.

2) The retrieval time is defined as $(T-L_i)$.

3) The HAI's of the designated periodic data file are scanned starting from most recent HAI until a HAI is found with an access time that is less or equal to the retrieval time. This HAI

is called the most current complete record available to the requesting process.

4) The value of RRT* determines which interval is to be delivered to the requesting process by using the most current complete record as a datum.

Note that by using a retrieval time of $(T-L_i)$, the process uses the available value, instead of waiting for the value corresponding to the current time. If the data link had zero lag time, then the available value would be the current value. For example, a clerk prepares an exceptional report based on data that he receives by mail. If he is asked to prepare the report he can either wait for the fresh mail or use the available mail. By using the second option no time is wasted in waiting for fresh mail.

2.2 Storage of Periodic Data File Intervals

After the process has generated its output, each of the output (storage) data links is initiated. There are j output links, each of lag L_j. Each of the output j values are stored in the following manner:

*The relative recency of retrieval (RRT), see subsection 2.4.

1) The link is initiated.

2) The interval to receive the value is the rightmost CAI, having an interval time (upper bound) greater than (T + D), i.e., the choice of the interval depends only on the initiation time and the duration of the activity.

3) The output value is posted as the true value of the interval.

4) Garbling is performed on the output value to get the recorded value of the interval.

5) The access time is equal to $(T + D + L_j)$.

2.3 The Error Detection and Correction Mechanisms

Errors mount up due to the difference between the actual and recorded values. These errors may be picked up and corrected by some mechanism within the organizational unit. This mechanism may be specified by the following methods:

1) A special, randomly or periodically triggered activity to detect and correct errors on periodic data files.

2) A function of the retrieval data links, by specifying a data correction factor (DCF) for the link. In this case, the recorded value delivered to the requesting process is partially

corrected using an exponentially weighted adjustment to the difference between the true and recorded values, as shown.

Modified recorded value = [(1 - DF) * recorded value
+ DF * true value]

where

$$DF = \min. \{\frac{IT - IT'}{w * DCF}, 1\}$$

where IT = upper bound of the oldest CAI

IT' = upper bound of the retrieval interval

DCF ≥ 1 and is specified by the user

By setting DCF of the link = 1, then DF = 1, in this case the modified recorded value would always be equal to the true value, regardless of the interval retrieved.

When DCF > 1 and the most recent HAI is retrieved, the amount of correction would be 1/DCF proportionately less than when DCF = 1. As older HAI's are selected, the modified recorded value approaches the true value, with a rate that depends on DCF. i.e., the data link would use the 'older the better' property.

2.4 Relative Recency of Retrieval (RRT)

RRT is specified at the activity level. It determines which interval is to be retrieved from a periodic data file. When an activity requests data from a periodic data

file , the most current interval available is determined as explained in subsection 2.1. However, the interval actually handed to the activity depends on the value of RRT as follows:

if RRT = 0 → the most current interval available

= 1 → the first interval after the most current

= 2 → the second interval after the most current

... etc.

if RRT = - 1 → the first interval before the most current

= - 2 → the second interval before the most current

A negative value of RRT may lead to the retrieval of a partially complete interval, i.e., a CAI.

A positive value of RRT, always retrieves a HAI. However when RRT exceeds the number of specified HAI's, an exponentially smoothed value of the rolled off HAI's is retrieved. This smoothed value exists for both the true and recorded rolled off value, calculated according to:

New recorded smoothed value = α* the recorded value just rolled off

+ (1-α)* old recorded smoothed value

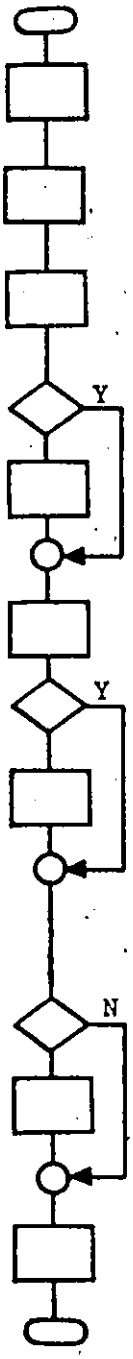
Same for the new true smoothed value. α is a specified

parameter of the periodic data file.

The following flowcharts show the general logic of retrieval, storage information data links.

RETRIEVAL

SIMPLE (No Link Process)



- Identify the accessed file.
- Calculate the retrieval time = activity initiation time - link lag.
- Using the access and the retrieval times, select the most current, available record.
- Is RRT = 0 ?
- Using RRT, locate the record to be retrieved.
- Retrieve the record.
- Is DCF = 0 ?
- Perform data correction.
- Was garbling specified?
- Garble the recorded value
- Display the record, to the requesting activity.

Fig. 3.4.

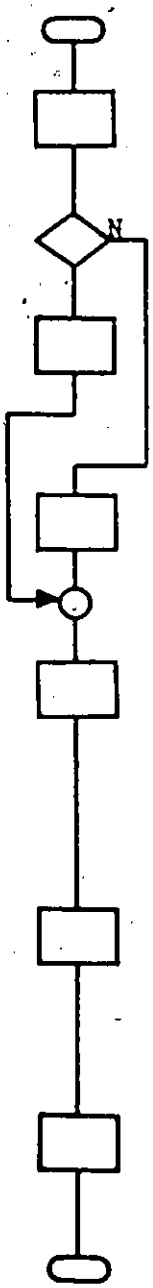
MACRO (With a Link Process)

- Add the lag of the macro link, to the individual lags of the process's input data links. This is done, to get the individual retrieval times.
- Initiate the process, which in turn, activates it's simple retrieval links, if any. The output of the process is displayed to the requesting activity.

Fig. 3.5.

STORAGE

SIMPLE



- Set the true value, to the output of the activity.
- Was garbling specified?
- Garble the true value, to obtain the recorded value.
- The recorded value, is set, equal to the true value.
- Select the appropriate interval, which will receive the new, posted values. This selection is based upon the activity termination time and the upper bounds of the various intervals.
- Calculate the access time = activity initiation time + activity duration + link lag.
- Using the true/recorded values and the access time, update the selected interval.

Fig. 3.6.

MACRO

- Was garbling specified?
- Garble the activity's output, to obtain the recorded value.
- Initiate the link process, which will perform the specified calculations on the true/recorded values.
- To store the output of the link process, initiate the appropriate output simple storage data links, that are specified in the link process. The sequence explained, for the simple storage link, is repeated, for each output link. Note that the duration of the link process, is embodied within the lag of the associated link. Therefore, the access time is the sum of the activity completion time + the lag of the macro link + the lag of each output storage link. The selection of the appropriate interval, to receive the new values, is based upon the activity completion time.

Fig. 3.7.

3. Transaction Data

It was previously explained that a transaction data set is made up of:

1) A set of values, each value has its true and recorded data images. The difference in the true recorded values is due to garbling in transaction data links similar to that of information links.

2) A set of parameters, there is only one value for each parameter.

3) In addition, a transaction access time which is based on the same basis as that of the periodic data file interval. The access time is the time at which the transaction is available to the system.

Figure 3.8 shows the data structure used for a transaction data set:

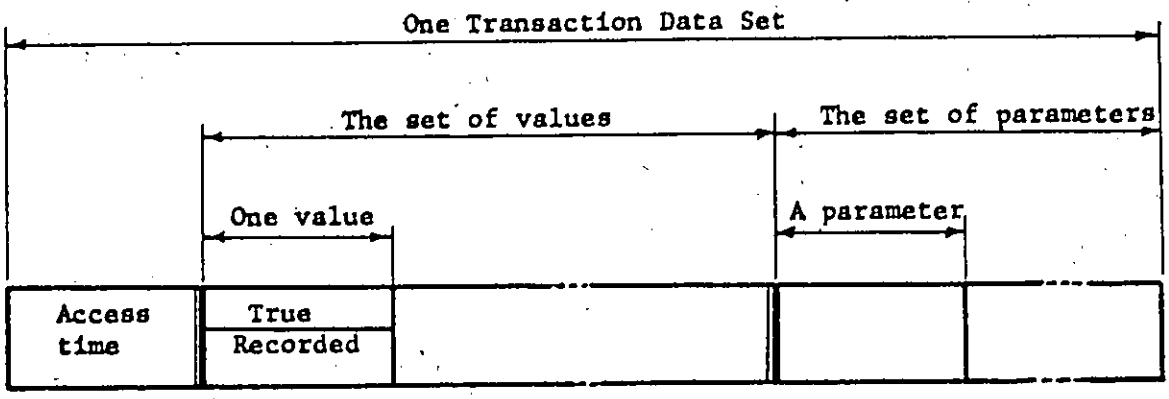
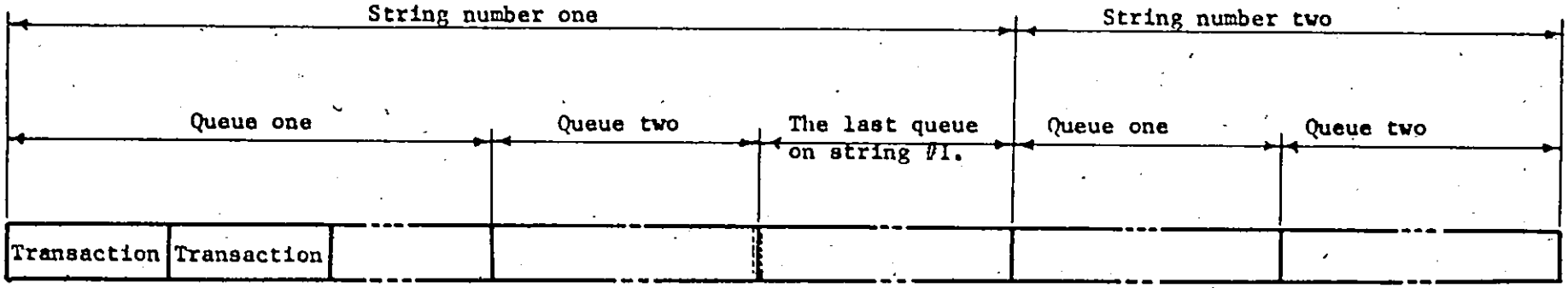


Fig. 3.8.

Each transaction data set moves along a transaction string. The data set is created at the beginning of the string and destroyed at its end. In front of each activity on the string, there is a queue. The data set waits on the queue until requested by the activity. The retrieval mechanism of the transaction link selects the data set, based on the access time. The activity processes the data set and when processing terminates, the data set is placed on the following queue with an access time equal to (activity initiation time + activity duration time + transaction data link lag time).

The location of the data set is dynamic and is kept track of by using the string matrix (SM), as shown in Figure 3.9 which assumes two transaction strings. The first string has three activities (other than the activity that created the data set) i.e., three queues. The second has two activities.

The flowcharts in Figures 3.10 and 3.11 show the general logic of retrieval and storage transaction data links.



TOTAL SIZE OF THE STRING MATRIX

$$= \sum \left[\text{MAX. QUEUE SIZE} * \left(2 * V + P + 1 \right) \right]$$

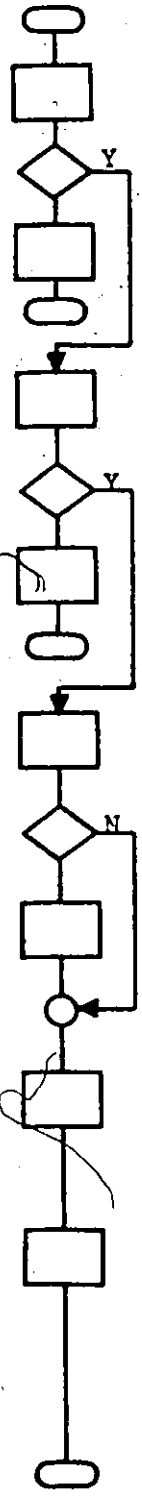
Over all queues.

- 2: Each value has a true and a recorded data image.
- V: The number of values per data set.
- P: The number of parameters per data set.
- 1: For the access time.

Fig. 3.9.

RETRIEVAL (No lags are associated with these links)

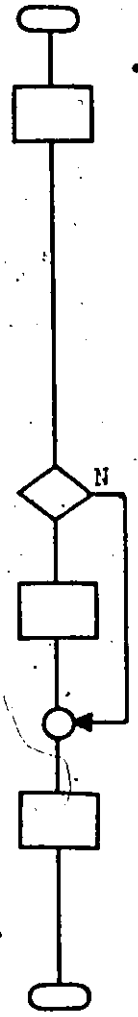
SIMPLE



- Set the retrieval flag to 0.
- Any transactions in the queue
- Set the retrieval flag to 1 and return.
- Set the retrieval time, equal to the activity initiation time.
- Are there any transactions, in the queue, with an access time, less than the retrieval time?. If no, set the retrieval flag to 2 and return.
- Using the access times, select the oldest transaction in the queue.
- Was garbling specified?
- Garble the values of the data set, to obtain the set of recorded values.
- Remove the selected transaction from the queue and perform push-down.
- Display the transaction true/recorded values and the parameters, to the requesting activity, together with the retrieval flag.

Fig. 3.10.

MACRO

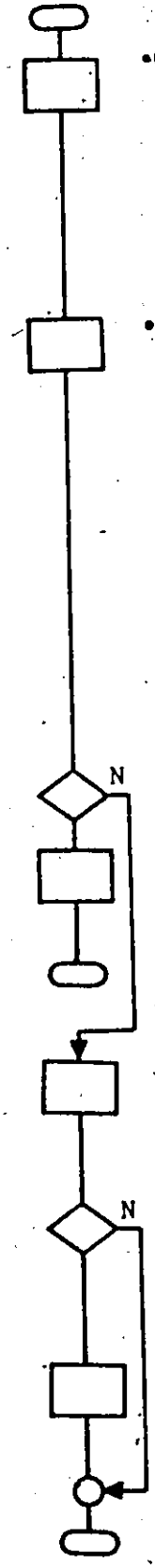


- Initiate the process, which will initiate the associated simple transaction retrieval links, as specified in the process. The process should result in the creation of a transaction data set.
- Was garbling specified?
- Garble the true values of the transaction, obtaining the set of recorded values.
- Display the transaction true/recorded values and parameters, to the requesting activity.

Fig. 3.11.

STORAGE

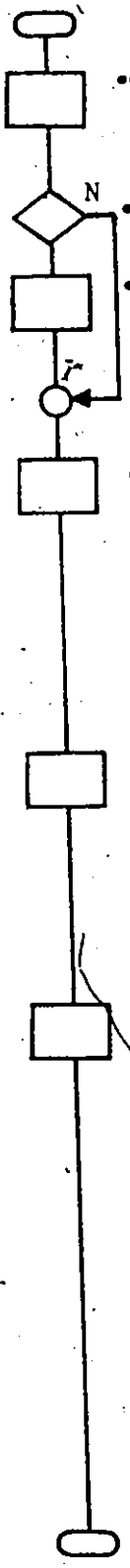
SIMPLE



- Calculate the access time of the transaction data set, that is going to be stored. The access time is equal to:-
  - activity initiation time
  - \+
  - activity duration
  - \+
  - link lag.
- Obtain the set of true values and transaction parameters, from the output of the activity. Note that the number of values and parameters may vary on the same transaction, as the transaction moves along the string. A set of garbling specifications is supplied for each value in the transaction. This set is used to obtain the recorded values.
- Is the queue full?
- Return the transaction to the activity and set the return flag.
- Insert the transaction in the queue, which is sorted by the access time.
- Does the arrival of a transaction, to this queue, trigger the next activity, on the string?
- Trigger the next activity on the string.

Fig. 3.12.

MACRO



- Obtain the set of true values and transaction parameters, from the output of the activity.
- Was garbling specified?
- Garble the true value to obtain the recorded value.
- Initiate the process. The set of values that were calculated in the previous steps are used as input to the process.
- To obtain the output of the process, perform the calculations specified in the process.
- Initiate the simple transaction storage links, that are specified in the process, to store the transaction. The access time is equal to:-
  - activity initiation time
  - \+
  - activity duration
  - \+
  - lag of the macro link
  - \+
  - lag of the simple link.

Fig. 3.13.

CHAPTER 4

SPECIFICATION AND INITIALIZATION SHEETS

1. Introduction

This chapter explains how the user specifies the CYBERSTRUCTURE to the simulator and how to initialize the system. To accomplish these two tasks, the user must fill two sets of sheets:

1) the specification sheets set
2) the initialization sheets set

Later, these two sets of sheets are recorded on punched cards and processed by the simulator.

2. The Specification Sheets Set

The user supplies the simulator, via this set, with the characteristics of the various entities of the CYBERSTRUCTURE under consideration. The simulator uses the supplied data to set up the appropriate computer model. This set is made up of the following six subsets:

2.1 Statistical Distributions Set

Statistical distributions are used to calculate the stochastic values that are needed during the simulation. For example, the simulator uses it to calculate the stochastic component of:

1) The activity duration

2) The data link lag time

These distributions may be used as well by the user in calculating any undeterministic attribute in the system.

Because of the frequent use of random variables in simulations, the following distributions are included in CYSDEM[†].

1) Uniform distribution
2) Normal distribution
3) Poisson distribution
4) Any other non-standard user distribution

2.1.1 User Distribution Specification Sheet

This sheet is used if the user requires a non-standard[††] distribution in his system. The sheet describes a series of points for the continuous cumulative probability curve. Each time this distribution number is referenced by the user, a random number is generated and the sheet is searched for the pair of random number values that bracket this value. The random deviate value is then determined by linear interpolation.

The sheet is shown in Figure 4.1 and is filled according to the following rules.

[†]Later versions will allow Markov type operations.

[††]Standard distributions are the normal, Poisson and uniform distributions and are available in the simulator.

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C Y S D E M

USER DISTRIBUTION SPECIFICATION FORM

FOR

DISTRIBUTION NUMBER ___ (1–3) (all cards)

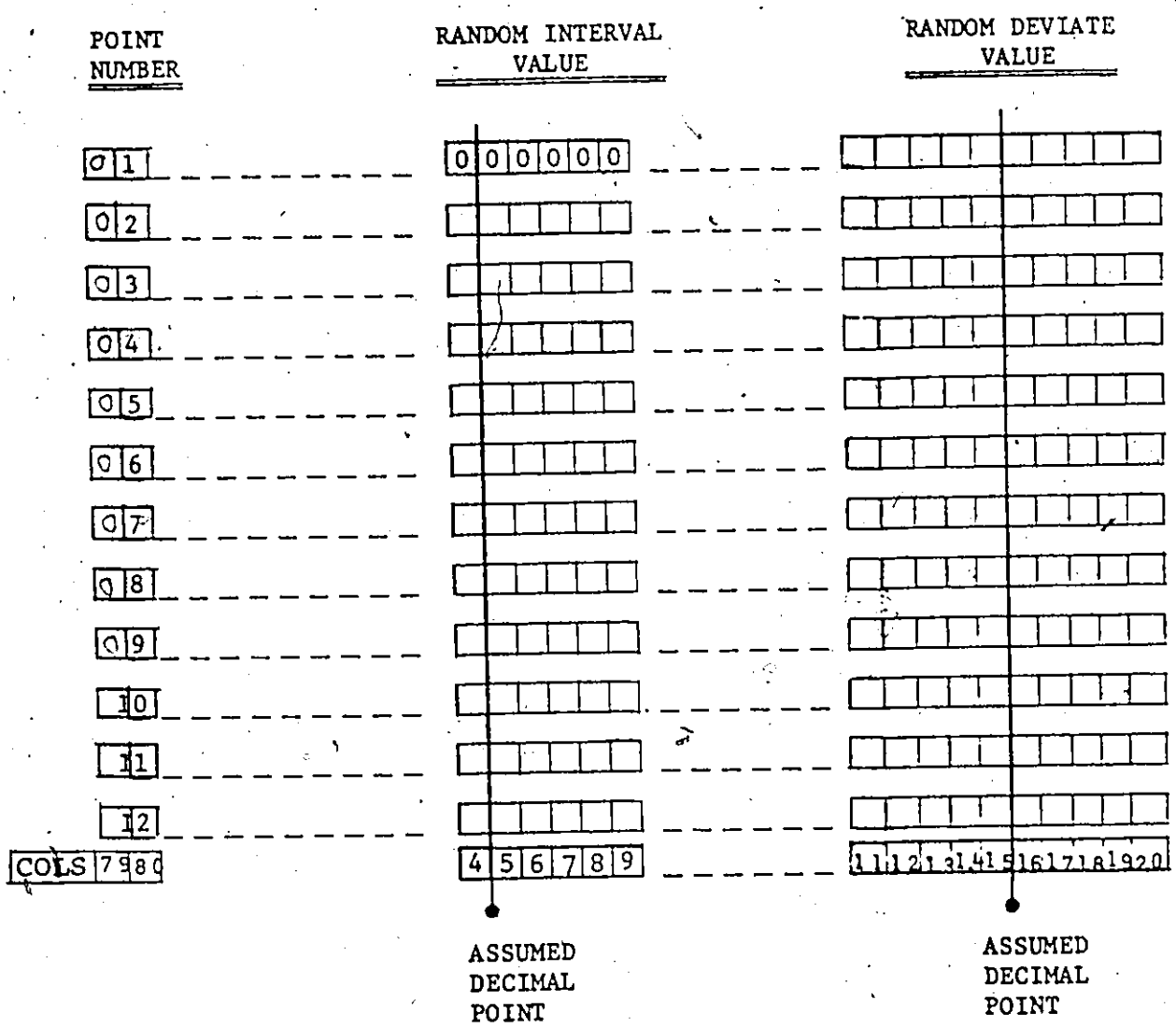

Fig. 4.1.

1) Each distribution needs one sheet and has a unique distribution number.
2) The curve is specified using up to 12 points.
3) The random number of the first point must be 0.
4) If the random number of the last point is not 1.0, then it would be automatically set equal to 1.0.

Example:

Assume that the lag of an information link is composed of two components:

1) A deterministic component of two STU's.
2) A stochastic component of

1 STU with probability 0.25
2 STU's with probability 0.50
3 STU's with probability 0.25

i.e., the total link lag may either be 3 or 4 or 5 STU's.

The distribution of the stochastic component is non-standard, as shown in Figure 4.2. Therefore, a user distribution specification sheet is needed. The distribution is specified by using 6 points, namely (0,1), (0.25,1), (0.25,2), (0.75,2), (0.75,3), (1.0,3).

Note:

The restriction of having to represent link lags and activity durations as integer multiples of STU's may

be overcome by using distributions. Assume the lag of a link is 0.5 STU's. This may be represented as follows:

1) A constant component of zero.

2) A stochastic component of:

0 STU's with probability 0.5

1 STU with probability 0.5

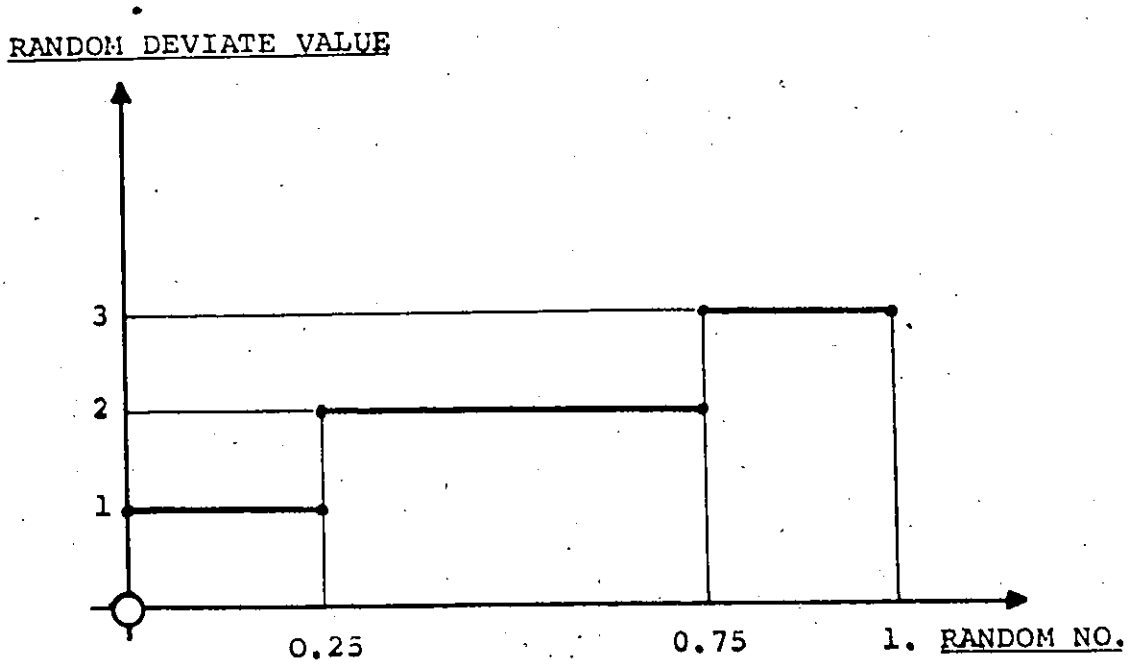

Fig. 4.2.

All distributions are available to the user by using the FORTRAN function call, as shown in Table 4.1:

Distribution	CALL FØRMAT X Receives the Result	Parameters
Normal	X = RNML(P1,P2,P3,P4)	P1=the mean P2=standard deviation P3=lower bound P4=upper bound
Uniform	X = UNFM(P1,P2)	P1=lower bound P2=upper bound
Poisson	X = NPSN(P1,P2,P3)	P1=the mean P2=lower bound P3=upper bound
User	X = UDST(P1)	P1=user distribution number

Table 4.1

2.1.2 The Distribution Parameters Specification Sheet

This sheet is optional and allows the user to change the parameters of the distributions without having to re-compile the program. Note that the parameters of the call formats in Table 4.1 can not be changed without recompiling the program.

The parameters of the distribution are recorded on the sheet (Figure 4:3), according to the following rules:

1) One line is used for each distribution.
2) In the first three columns enter a unique number, used in the call formats (Table 4.2) to reference the appropriate row in the

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C Y S D E M

DISTRIBUTION PARAMETER SPECIFICATION FORM

DL	PARAM SET NUMB	PARAMETER ONE (MEAN)	PARAMETER TWO (STANDARD DEVIATION)	PARAMETER THREE (LOWER BOUND)	PARAMETER FOUR (UPPER BOUND)	CARD NO.
	1 2 3	4 5 6 7 8 9 10 11	12 13 14 15 16 17 18 19	20 21 22 23 24 25 26 27	28 29 30 31 32 33 34 35	76 79 80

ASSUMED DECIMAL POINTS - TO OVERIDE, PUNCH OWN IN CORRECT POSITION

Fig. 4.3.

distribution parameter specification sheet.

3) Entries in the parameter fields depend on which distribution is referencing this row for parameters, as shown in Table 4.2.

Table 4.2 shows the call formats to be used, for the normal, uniform and Poisson distributions. The user defined distributions need not use this technique as their parameters may be changed in the specification sheet (Figure 4.2) without recompiling.

I in the call format is the parameter set number in the distribution parameter specification sheet		
Distribution	Call Format	Required Parameters in the Dist. Param. Spec. Sheet
Normal	X = RNML(DP(I,1),DP(I,2), DP(I,3),DP(I,4))	All four parameters
Uniform	X = UNFM(DP(I,3),DP(I,4))	Last two parameters
Poisson	X = NPSN(DP(I,1),DP(I,3), DP(I,4))	First and last two parameters

Table 4.2

2.2 Information Data Link Specification Sheet

One of these sheets must be supplied for each information data link in the CYBERSTRUCTURE.

The sheet is shown in Figure 4.4. The user supplies the answers to the 11 questions on the sheet.

Q.1	Enter the four digit information link number. It must be right justified and zero filled to the left. The number must be greater than 1 as the buffer for information link 1 is used to transfer the garbling parameters, as explained later.
Q.2	Enter the 2 digit link lag time. Enter 00 if this link doesn't have any lag. The lag time must be specified in terms of complete STU's.
Q.3	Not used in the current version of CYSDEM, therefore this entry is ignored.
Q.4	This entry indicates the type of the stochastic process to be performed on this link. If no stochastic process is required, then enter 0. In this case the five questions that follow this question are ignored. This question has 6 possible answers† as shown on the sheet in Figure 4.4.
Q.5	This entry indicates how to get the mean and the standard deviation of the distribution that is associated with the stochastic process on this link. Table 4.3 explains the various possible entries.

†Markov type is not available in the current version of CYSDEM.

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C Y S D E M

INFORMATION LINK PROCESSING SPECIFICATION FORM

1. INFORMATION LINK NUMBER (ILN) 1 4

2. INFORMATION LINK LAG TIME (ILT) 5 6

3. IS STORAGE PERMITTED IN HAI'S? 7

   0 - NO
   1 - YES
   2 - N/A

4. TYPE OF STOCHASTIC PROCESSING (IDC) 8

   0 - NONE
   1 - NORMAL
   2 - POISSON
   3 - UNIFORM
   4 - MARKOV
   5 - USER DISTRIBUTION

5. DISTRIBUTION PARAMETER CODE FOR μ, σ (IDP)
   (REFER TO MANUAL) 9 10

6. UPPER/LOWER BOUNDARY DETERMINATION (IBC) 11

   0 - N/A
   1 - FROM PARAMETER TABLE
   2 - ± STANDARD DEVIATION * MODIFIER

7. RESULT OF STOCHASTIC PROCESSING IS (ISR) 12

   0 - IS THE RECORDED VALUE
   1 - ADDED TO THE TRUE VALUE
   2 - ADDED TO THE RECORDED VALUE (RETRIEVAL ONLY)

8. PARAMETER SET, USER DISTRIBUTION, OR MARKOV
   TRANSFORMATION NUMBER (NSP) 13 14

9. MODIFIER (BMD) 15 . . . 20

10. DATA CORRECTION FACTOR (DCF) 21 . . . 25

11. ARE UPDATES TO THE FILE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (=0), FOR ALL CURRENT ACCUMULATION INTERVALS (=1), OR FOR ALL INTERVALS, I.E., CAI'S AND HAI'S (=2)
    (NOTE: FILE TYPE 6 SHOULD BE EITHER 1 OR 2) 26

Fig. 4.4.

First Digit (C/C 9), Used to Get the Mean		Second Digit (C/C 10), Used to Get the Standard Deviation	
Entry	Explanation	Entry	Explanation
1	Mean is taken from the parameter set indicated in Q.8.	0	St. Dev. = $\sqrt{\text{mean}}$, used for Poisson distributions.
2	The mean is the true retrieved value or the true value to be stored.	1	St. Dev. is taken from the parameter set indicated in Q.8
3	The mean is the recorded value (prior to garbling), used in retrieval only.	2	St. Dev. = mean
4	The mean is the smoothed true value, taken from the associated periodic data file.	3	Used only if the link is associated with a periodic data file of type 4. St. Dev. is taken from the true smoothed standard deviation.

Table 4.3

Q.6 Indicates how the distribution's upper and lower bounds are obtained, used to truncate the result of the stochastic process.

0 → no truncation is required

1 → obtained from the parameter set indicated in Q.8

2 → obtained by multiplying the standard deviation by a modifier in Q.9.

Q.7 Indicates how the final recorded value is obtained.

0 → The recorded value is the stochastic, truncated value

1 → The recorded value = stochastic truncated value + the true value.

2 → The recorded value = stochastic truncated value + the stored recorded value

This is used in retrieval only.

Q.8 Used to cross reference the associated parameter set (row number in the distribution parameter specification sheet) or the associated user distribution or Markov transformation.

Q.9 Enter the modifier to be used in calculating the upper and lower bounds of the distribution. This requires an entry of 2 to Q.6.

Q.10 Enter the data correction factor that is used to correct the recorded value, as explained in Chapter 3. Enter 0 if no correction is required.

Q.11 Used only with data links that post values to level periodic data files (type 6). To clarify the use of this entry consider the following level file:

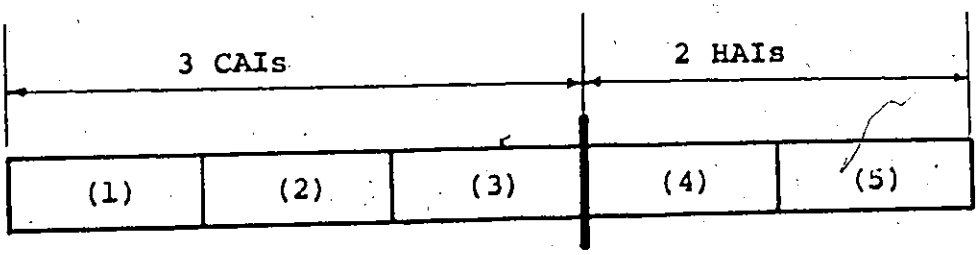

Fig. 4.5.

In a level file, the interval carries the up-to-date balance. Therefore, any newly created CAI will carry the balance of the previous CAI. If a posting (+ve or -ve) is done to any CAI then all CAI's in front of it should be updated as well. i.e., if a posting is done to (2) in Figure 4.5 then intervals (1) and (2) should get updated.

0 → update only the specified interval. This is used only if the link is a retrieval link or the file is not a level file.

1 → update the specified CAI and all CAI's in front of it. No updates to HAI's are allowed.

2 → If the posting is done to a HAI, then update it and all HAI's and CAI's in front of it.

2.3 Periodic Data Files Specification Sheets

One of these sheets is required for each periodic data file. The sheet is shown in Figure 4.5(b).

Q.1 Enter the file identification number. This is the same number that was used in the CYBERSTRUCTURE. It must be right justified.

Q.2 Enter 10 alpha numeric characters that describe the file. These characters are used only for output purposes.

Q.3 Enter the file type. There are 6 possible types, as explained in Chapter 2, Table 2.1. This entry indicates to the simulator what to do when one or more postings are done to the same interval.

Q.4 Enter the interval size in integer multiples of STU's. This was discussed in Chapter 2.

Q.5 a) Each periodic data file is represented within the simulator as a singly subscripted array. This entry is called the first dimension 'L', used in calculating the size of the required array and should be set equal to:

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C Y S D E M

PERIODIC DATA FILE PARAMETER SPECIFICATION FORM

1. FILE IDENTIFICATION NUMBER (II) (1–4)

2. ALPHANUMERIC DESCRIPTION OF FILE (FNM) (5–14)

3. FILE TYPE (IFT) (15)

   1 - LARGEST VALUE OVER INTERVAL
   2 - SMALLEST VALUE OVER INTERVAL
   3 - SUM OVER INTERVAL
   4 - STATISTICAL (MEAN, STD. DEVIATION)
   5 - REPLACEMENT VALUE
   6 - CUMULATIVE SUM (LEVEL)

4. INTERVAL SIZE OF FILE IN STU'S (INTS) (16–19)

5. FILE DIMENSION SIZES

   (a) SIZE OF FIRST DIMENSION (L)
   (PLEASE REFER TO MANUAL TO SPECIFY THIS VALUE) (20–22)

   (b) SIZE OF SECOND DIMENSION (M)
   (ENTER 01 IF NO SECOND DIMENSION) (23–24)

   (c) SIZE OF THIRD DIMENSION (N)
   (ENTER 01 IF NO THIRD DIMENSION) (25–26)

6. NUMBER OF CURRENT ACCUMULATION INTERVALS (NCA) (27–29)

7. NUMBER OF HISTORIC ACCUMULATION INTERVALS (NHA) (30–32)

8. SMOOTHING FACTORS FOR END VALUES

   (a) ALPHA FOR RECORDED VALUE(S) (A1) 0.__ (33–35)

   (b) ALPHA FOR TRUE VALUE(S) (A2) 0.__ (36–38)

9. MAXIMUM STORE-AHEAD OF INOW (IN STU'S) (MSA) (39–42)

10. FOR LEVEL FILES, IS A NEGATIVE BALANCE PERMITTED?

    IF YES, SPECIFY EVENT CODE AND SUB-CODE NUMBER AND EVENT RECOGNITION DELAY TIME FOR THE ACTIVITY WHICH HANDLES THE NEGATIVE BALANCE PROCESSING

    IF NO (OR N/A) ENTER ZEROES:

    (a) EVENT CODE (43–44)

    (b) EVENT SUB-CODE (45–47)

    (c) DELAY TIME FOR EVENT INITIATION (48–49)

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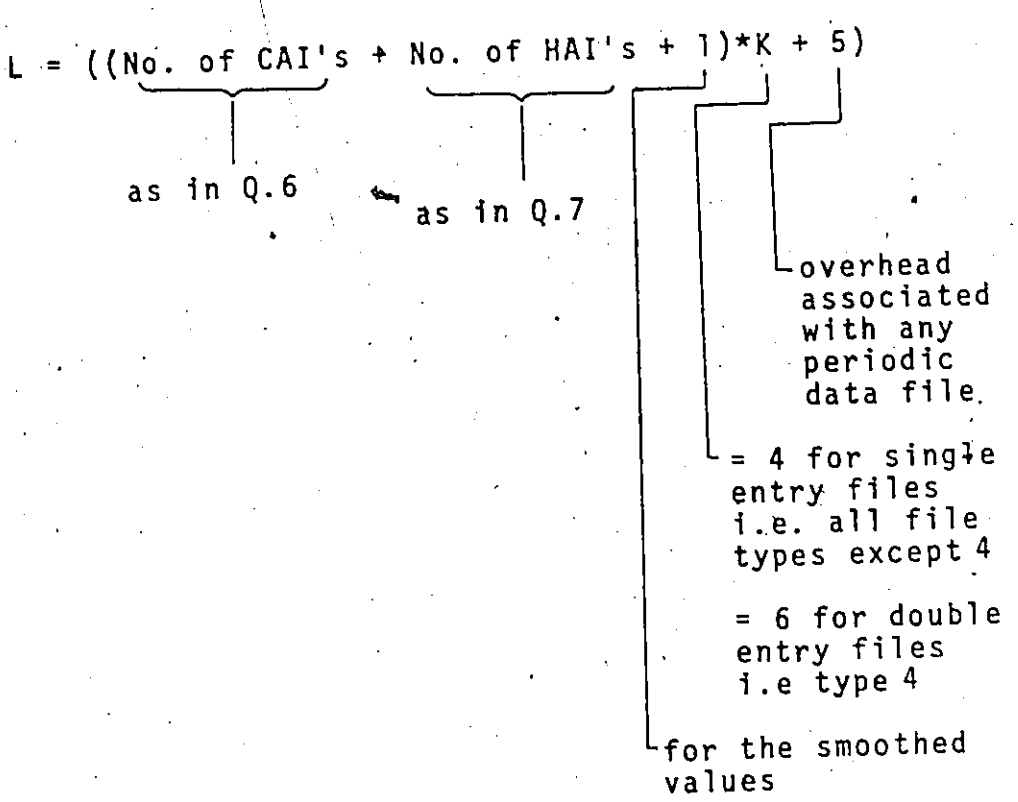
Fig. 4.5(b)



b) This entry is used if the file has 2 or 3 dimensions. If the file has only 1 dimension, then enter 01.

c) This entry is used if the file has 3 dimensions. If the file has only 1 dimension, enter 01.

Figure 4.6 shows a layout of a periodic data file.

Q.6 Enter the number of current accumulation intervals. The following formula is used to ensure that all activities that post values to this periodic data file will find a CAI to post that value to.

. The contents of the first dimension is repeated for each change of index in the second or the third dimensions.

M= Second dimension
N= Third dimension

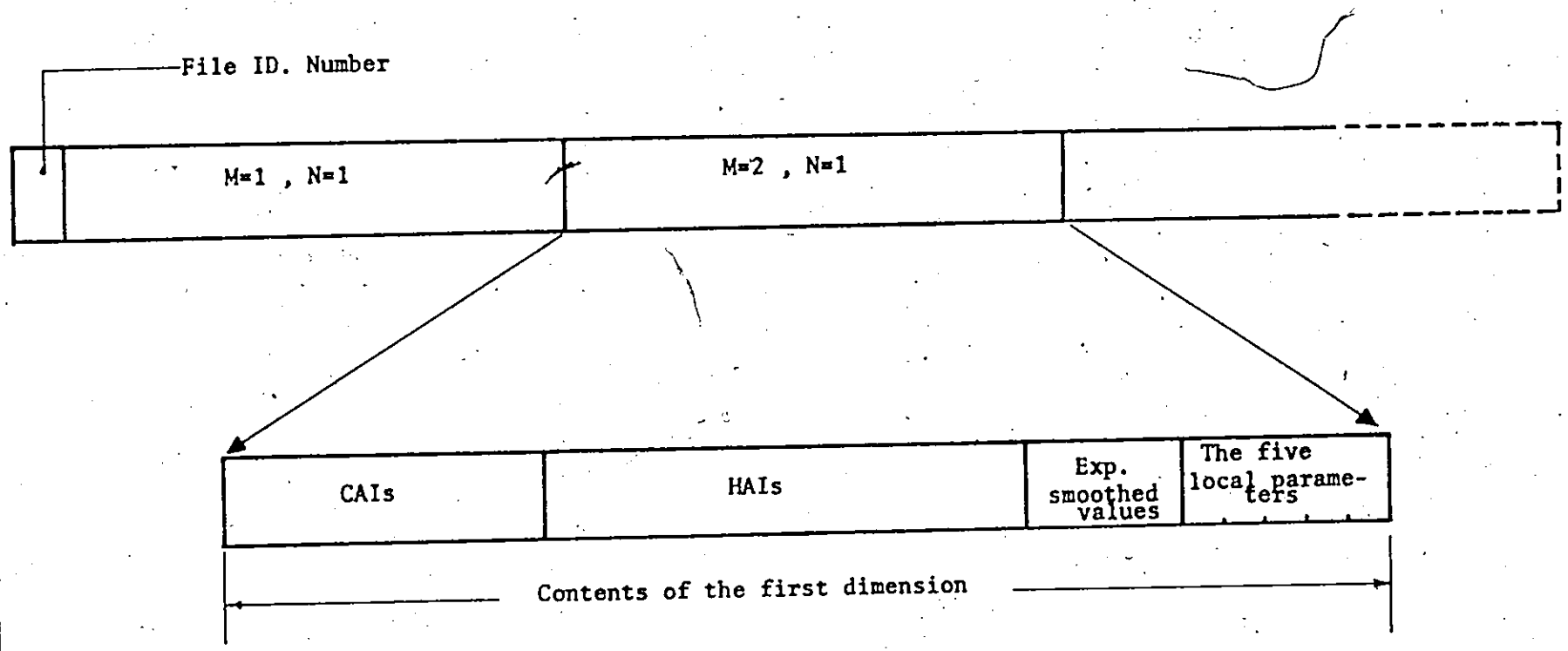


Fig. 4.6

$$\text{No. of CAI's} \geq [1 + \max. \{\frac{\text{activity duration}}{\text{file interval size}}\}]$$

i.e., the above calculation has to be repeated for all activities posting values to this file. The largest result is considered.

This obviously should be an integer value.

Q.7 Enter the number of historic accumulation intervals. Chapter 3, section 1.2.1 explained how intervals are retrieved from periodic files. The interval retrieved depends on the retrieval time which in turn depends on the link lag time. Therefore, there should be a sufficient number of HAI's, otherwise the smoothed average interval will be retrieved. The following formula is used to calculate the sufficient number of HAI's

$$\text{No. of HAI's} \geq \text{Max.} \{[\frac{\text{link lag time}}{\text{file interval size}}] + \text{RRT}\}$$

integer division

The relative recency of retrieval (Chapter 3, section 2.4)

i.e., the calculation is repeated for all data links retrieving values from the file.

Q.8 This entry is the smoothing factor α that is used in calculating the smoothed, rolled-off values,

as explained in Chapter 3, section 2.4. The smoothing factor may range from 0 to 0.999. The effect of newer HAI's on the smoothed values may be increased by increasing α and decreased by decreasing α. A conservative value of α is 0.1 for both the true and recorded smoothed values.

Q.9 When a value is posted to a file, the interval chosen is that with upper and lower bounds that bracket (T+D), as explained in Chapter 3, section 2.2. The maximum value of (T+D) is the upper bound of the first CAI. An error will result by attempting to post a value, beyond that upper bound because no CAI exists to receive the posted value. Normally the maximum store ahead parameter is set equal to the number of CAI's multiplied by the interval size. However, it may set to any value between 0 and the above mentioned value to restrict postings to available CAI's. Obviously, a value of 0 will restrict any postings to the file.

Q.10 This entry is used in conjunction with level files only (otherwise set to zeros). If it is required to initiate an activity to handle the negative balance condition detected on the file, then appropriate entries should be made here. Enter

the activity code and sub-code in parts (a), (b). In (c) enter the delay in initiating the activity (in STU's) relative to the access time of the interval to which the posting is done. If this feature is used, then when the negative balance is detected for either the true or the recorded values, a value of zero is stored in the interval and the difference between the negative value and zero is made available to the specified activity. i.e., the balance is not allowed to go negative.

Note that the data link connecting the periodic data file and the negative balance activity is not actually a data link. It doesn't have a link number, therefore, no specifications. The CYBERSTRUCTURE representation is shown in Figure 4.6(a).

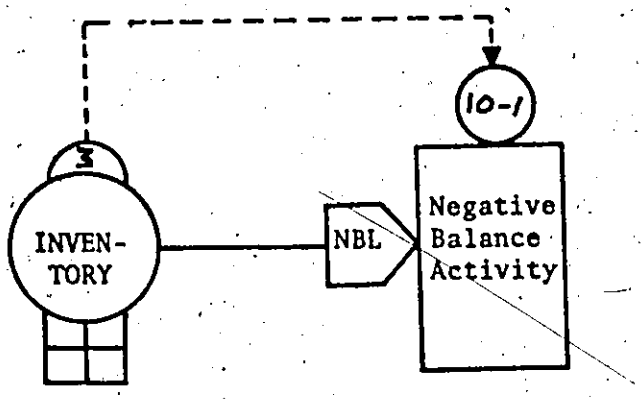


Fig. 4.6(a)

2.4 Transaction Data Links Specification Sheets

The specification of transaction data links is similar to that of information data links, except for the following differences:

1) Garbling is performed on each value on the transaction. Therefore, a set of garbling parameters is needed for each value. Transaction parameters are not garbled.
2) There is no data correction factor.

The transaction data link specification sheet is shown in Figure 4.7 and a sheet is needed for each transaction data link.

Q.1 Enter the link number as 4 digits, right justified.

Q.2 Enter the lag, in STU's, associated with this link. This lag is used in calculating the access time of the transactions waiting in the queue to be processed by the next activity on the string as shown in Figure 4.8. This entry is used only for storage links. i.e., used for TL1,5 and not TL1,6 of Figure 4.8

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TRANSACTION LINK PROCESSING SPECIFICATION FORM

1. TRANSACTION LINK NUMBER (1–4)

2. PASSAGE TIME DELAY (STORE ONLY) (5–7)

3. DOES THIS LINK TRIGGER NEXT EVENT (8)
   0-NO 1-YES

4. TRANSACTION VALUE GARBLING
   A. TYPE OF STOCHASTIC PROCESSING (ITDC)
      0-NONE 3-UNIFORM
      1-NORMAL 4-MARKOV
      2-POISSON 5-USER DISTRIBUTION

VALUE SET	1	2	3	4	5	6	7	8	9	10
ITD VALUE										

→ (to be punched)

(cols.) 9 – 18

   B. DISTRIBUTION PARAMETER CODE FOR μ,σ(ITDP)

VALUE SET	1	2	3	4	5	6	7	8	9	10
ITDP VALUE										

(cols.) 19 – 38

   C. UPPER/LOWER BOUNDARY DETERMINATION CODE (ITBC)

VALUE SET	1	2	3	4	5	6	7	8	9	10
ITBC VALUE										

→ (to be punched)

(cols.) 39 – 48

   D. THE RESULT OF STOCHASTIC PROCESSING IS (ITSR)
      0-THE GARBLED VALUE
      1-ADDED TO THE NON-GARBLED VALUE
      2-ADDED TO THE EXISTING GARBLED VALUE

VALUE SET	1	2	3	4	5	6	7	8	9	10
ITSR VALUE										

→ (to be punched)

(cols.) 49 – 58

   E. PARAMETER SET, USER DISTRIBUTION, OR MARKOV TRANSFORMATION NUMBER (NTSP)

VALUE SET	1	2	3	4	5	6	7	8	9	10
NTSP VALUE										

→ (to be punched)

(cols.) 59 – 78

Fig. 4.7.

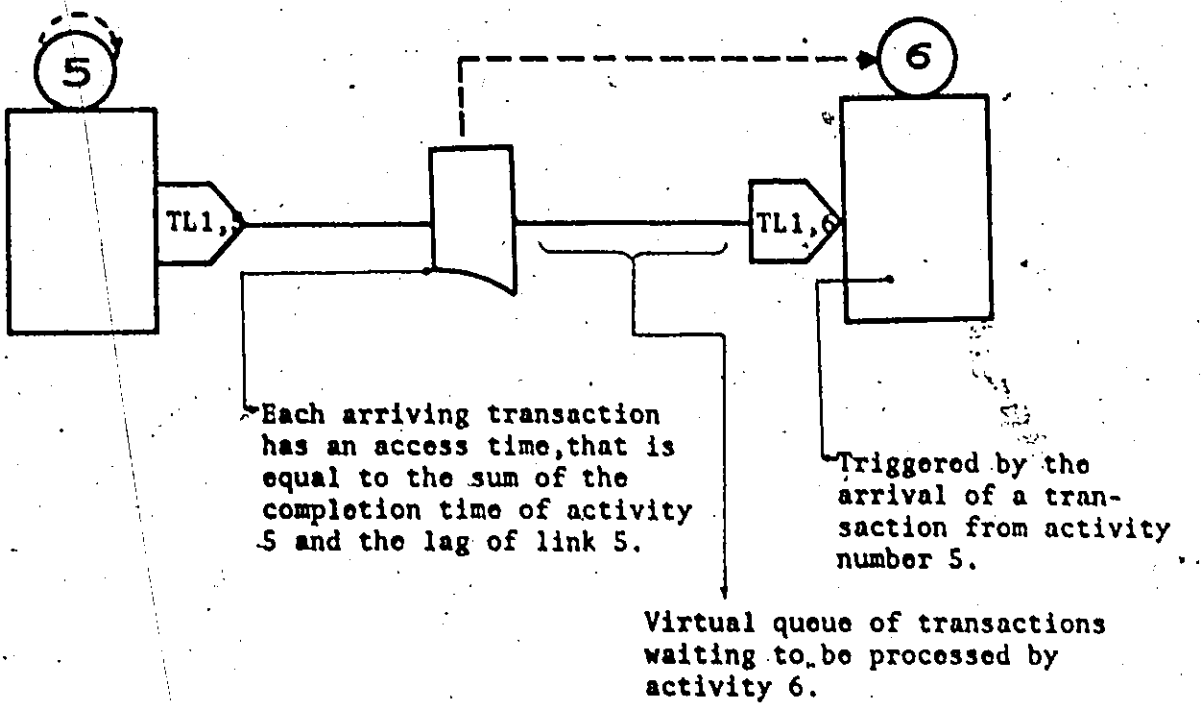

Fig. 4.8.

Q.3 This entry determines if the associated activity is triggered by the arrival of a transaction on the queue. This applies only for storage links. Activity 6 of Figure 4.8 is an example, therefore, this entry for TL1,5 will have a value of 1.

Q.4 These entries are the garbling specifications for each value on the transaction. There may be up to 10 values on one transaction. These specifications are exactly the same as those for the information data links (Chapter 4, section 2.2). The only exception is the upper/lower boundary

determination code which may be either 0 or 1.

2.5 Transaction String Specification Sheet

Only one of these sheets is required to define all the transactions strings available in the system. The sheet is shown in Figure 4.9. It has two main parts:

1) General Information

This part defines the global string parameters. i.e., parameters that change from one string to another.

Q.1 Enter the number of transaction strings in the system.

Q.2 Four entries are supplied for each string. These four entries are made in one column under the string number. Each entry requires one digit.

1. No. of events on string:

   Enter the number of activities on the string, excluding the activity that generates the transaction. i.e., the number of queues on the string.

2. No. initial xacts specified:

   Enter the number of initial transactions on this string, regardless of the queue on which they are initially placed on. Refer to section 3.3 of this chapter for transaction initialization.

DATE ___/___/___

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CYSDEM

TRANSACTION EVENT STRING SPECIFICATION FORM

FIRST CARD - GENERAL INFORMATION

1. Number of transaction strings..... [ ]

2. String information:

STRING NUMBER :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. EVENTS ON STRING :															
No INITIAL XACTS SPECIFIED :															
No TRUE/GARBLED PAIRS :															
No XACT PARAMETERS :															
Col. nos.(top to bottom)	2-5	6-9	10-13	14-17	18-21	22-25	26-29	30-33	34-37	38-41	42-45	46-49	50-53	54-57	58-61

3. Number of transaction links specified.... [ ] (62 63)

NEXT CARDS : EVENT SEQUENCE AND ALLOCATION DATA

1. String number (S)
2. Event code (CD) and sub-code (SCD)
3. Maximum number of transactions permitted to wait at the event (MXQ)

(NOTE: a) one card per line, b) begin new card for each new string number,
c) events to be entered in sequence of occurence on string)

EVENT (1,9..)				EVENT (2,10..)				EVENT (3,11..)				EVENT (4,12..)				EVENT (5,13..)				EVENT (6,14..)				EVENT (7,15..)				EVENT (8,16..)			
S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ	S	CD	SCD	MXQ

3. No. true/garbled pairs:

Enter the number of values associated with each transaction on this string.

4. No. xact parameters:

Enter the number of parameters on each transaction of this string.

Q.3 Enter the total number of transaction links in the system.

2) Event Sequence and Allocation Data

This part is the local string parameters. It defines what activities are on the string and the maximum size of the queue associated with each of these activities. This part is filled according to the following rules:

1. There are 16 rows, each row is used to define up to 8 activity/queue along a string.
2. When defining a new string always start with a new row, otherwise the same row may be used.
3. Each activity/queue entry needs 4 entries:
   1) S : Enter the string number.
   2) CD: Enter the event code (1→16).
   3) SCD: Enter the event subcode (1→64).
   4) MXQ: Enter the maximum size of the queue associated with this activity. The result of exceeding the queue size is that the transaction is lost and an error message

is printed. The maximum queue size depends on the rate of generating transactions, rate of removing them from the queue and the link lag time.

4. The activity that generated the transaction, i.e., the first activity on the string, does not need an entry.
5. The first activity/queue encountered by the transaction on the string must be followed by the second activity/queue and so forth.

2.6 The Activity Specification Sheet

This sheet specifies the triggering and duration parameters for all activities in the system. The sheet is shown in Figure 4.10. One line is needed for each activity. Each line is made up of the following three parts:

1) Activity

Enter the activity code and sub-code, as it appears on the CYBERSTRUCTURE.

2) Trigger

This part contains the two triggering parameters. Table 4.4 explains the various possible entries.

TRIGGERING METHOD	VALUE OF TC	VALUE OF TPRM, MEANING
Periodic	1	The value of TPRM is the inter-occurrence time in STU's
Externally Triggered	0	The activity is not rescheduled when initiated, therefore, TPRM is ignored.
Self Triggered	0	
Randomly Triggered	2	The recurrence time is random according to a normal distribution whose parameters are in the parameter set number indicated by TPRM.
	3	Just like the above except that the recurrence time is according to a uniform distribution

Table 4.4

3) Processing Time

This part contains the parameters needed to calculate the duration. There are seven parameters:

.AT Enter the deterministic component of the duration.

.D Enter 0 if no stochastic component, in this case the rest of the parameters are ignored. If a stochastic component exists, then D may take any of the following values depending on the distribution that is used to calculate the stochastic component:

1 - Normal 2 - Poisson 3 - Uniform
4 - Markov (not current version) 5 - User distribution

.MV This entry indicates how to get the mean and variance of the distribution, as shown in Table 4.5.

FIRST DIGIT TO GET THE MEAN		SECOND DIGIT TO GET THE STANDARD DEVIATION	
Entry	Explanation	Entry	Explanation
1	Mean obtained from parameter set whose number is in the sixth parameter (PTP)	1	$\sqrt{\text{mean}}$
2	AT is the mean	2	St. dev. obtained from parameter set whose number is in the sixth parameter (PTP).

Table 4.5

.B This entry indicates how bounding is to be done, if any.

1 - no bounding required

2 - upper/lower bounds obtained from parameter set whose number is in the sixth parameter (PTP)

3 - upper/lower bounds = St. deviation $\pm$ the modifier specified in TMD (last parameter)

.R Upon calculating the stochastic value and bounding it, this entry indicates how the activity duration is obtained:

0 - The duration is the stochastic, bounded value.

1 - The stochastic, bounded value is added to AT

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CARD [A] 77 80

CYSDEM

ACTIVITY PROCESSING SPECIFICATION FORM

GENERAL : EACH LINE (ONE CARD) SPECIFIES ONE ACTIVITY IN TERMS OF :

1) Its activity code (CD) and sub-code (SCD)

2) The method of triggering code (TC) and a corresponding parameter value (TPRM)

3) Activity processing time determination including : the average time (AT), the distribution code (DC), the mean/variance code (MV), the boundary value code (B) , the result code (R), a parameter number (PTP), and a modifier (TMD).

The values for the codes appear on the back of this form.

	ACTIVITY		TRIGGER		PROCESSING TIME						
CARD	CD	SCD	TC	TPRM	AT	D	MV	B	R	PTP	TMD
01											
02											
03											
04											
05											
06											
07											
08											
09											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
Col.	1 2 3 4		5	6 7 8 9	10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28						

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Fig. 4.10.

to get the duration.

.PTP Enter the parameter distribution number or the user distribution number, depending on the previous entries.

.TMD Enter the modifier, used in calculating the upper/lower bounds.

3. The Initialization Sheets Set

The system's initial state reflects the state of the system at the start of the simulation. The initial state of the system is specified by supplying the simulator with the initial state of the individual entities via the initialization sheets set. This set is made up from the following four types of sheets:

3.1 Simulator Initialization Data

One of these sheets is needed for each simulation. It contains general information about the simulation and the size of the events list. The sheet is shown in Figure 4.11.

Q.1 Enter the simulation start time (IBEG). The clock is set initially to IBEG, then advanced by a time slice of one STU as the simulation progresses in time. IBEG must be large enough such that all HAI's of periodic data files have positive lower limits. The calculation to be performed to ensure this

condition is:

IBEG ≥ Max. {Interval width * [1 + NO. of HAI's]}

└— to be performed for all periodic data files, the largest result is taken.

Q.2 Enter the simulation ending time (IEND). When the clock reaches IEND, the simulation will terminate. IEND must be large enough so that the system overcomes any transient effects and proceeds to run for some time in the steady state.

Q.3 These four entries determine the size of the events list.

a) Enter the maximum time span, in STU's, between event scheduling and execution. This entry determines the number of rows in the events list. Each row contains the codes of the events that will be executed at a specific value of the clock. The first row always contains event codes of events to be executed at the current clock time (INOW). Therefore, the events list is dynamic because after all the events that are scheduled to be executed at INOW are executed, pushdown is performed on the events list. As a result, the first row is lost to the system and a new empty row is appended to the end of the events list and

DATE __/__/__

RUN NUMBER _____ I (73–77)

C Y S D E M

SIMULATOR INITIALIZATION DATA

1. SIMULATION STARTING TIME (IBEG) . . . . . (1–3)
2. SIMULATION ENDING TIME (IEND) . . . . . (4–7)
3. EVENT FILE PARAMETERS . . . . . .
   (a) MAXIMUM TIME SPAN BETWEEN EVENT SCHEDULING AND EXECUTION (MME) . . . . . (8–10)
   (b) MAXIMUM NUMBER OF EVENTS SCHEDULED FOR ANY GIVEN TIME (NME) . . . . . (11–13)
   (c) MAXIMUM ADDITION OF EVENTS DURING INOW TO INOW (NA) . . . . . (14–15)
   (d) EVENT EXECUTION (SORT) CODE (IEVP) (0-NO SORT, 1-SORT ON EVENT CODE, 2-SORT ON EVENT CODE AND SUB-CODE) . . . . . (16)
4. NUMBER OF INFORMATION LINKS SPECIFIED FOR THIS SIMULATION (NIL) . . . (17–19)
5. NUMBER OF DISTRIBUTION PARAMETER SETS USED (NDPS) . . . . . (20–21)
6. NUMBER OF USER DISTRIBUTIONS SPECIFIED (NUDS) . . . . . (22–23)
7. NUMBER OF MARKOV I/O MATRICES TO BE READ IN (NMKV) . . . . (24–25)
8. NUMBER OF ACTIVITY SPECIFICATION RECORDS (NACT) . . . . . (26–28)
   TO BE READ IN
9. ERROR PROCESSING DESIGNATION TABLE

   NUMBER OF ERROR CODES SPECIFIED (NEC): FROM ONE TO . . (29–30)

   ERROR CODES (BEGIN SEPARATE CARD, COL. 1 IS ERROR CODE 1, ETC.)
   0 - IGNORE (NO ERROR MESSAGE)
   1 - NON-FATAL 2 - FATAL

1 ___	11 ___	21 ___	31 ___	41 ___	51 ___	61 ___
2 ___	12 ___	22 ___	32 ___	42 ___	52 ___	62 ___
3 ___	13 ___	23 ___	33 ___	43 ___	53 ___	63 ___
4 ___	14 ___	24 ___	34 ___	44 ___	54 ___	64 ___
5 ___	15 ___	25 ___	35 ___	45 ___	55 ___	65 ___
6 ___	16 ___	26 ___	36 ___	46 ___	56 ___	66 ___
7 ___	17 ___	27 ___	37 ___	47 ___	57 ___	67 ___
8 ___	18 ___	28 ___	38 ___	48 ___	58 ___	68 ___
9 ___	19 ___	29 ___	39 ___	49 ___	59 ___	69 ___
10 ___	20 ___	30 ___	40 ___	50 ___	60 ___	70 ___

Fig. 4.11.

(OVER)

SIMULATOR INITIALIZATION DATA (cont.)

10. EVENT-CODE/ACTIVITY-CODE EQUIVALENCE MATRIX.

EVENT CODE	00		01		02		03		04		05		06		07		08		09		10		11		12	
EQUIVALENT ACTIVITY CODE																										
CARD COLUMN	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

EVENT CODE	13		14		15	
EQUIVALENT ACTIVITY CODE						
CARD COLUMN	27	28	29	30	31	32

Fig. 4.11(cont.)

INOW is updated by one STU to point to the new first row.

b) Enter the maximum number of events that may be scheduled to occur at any value of the clock. This entry is used to determine the number of columns in the list†. As a rule of thumb, set it equal to the total number of activities in the system.

c) Enter the maximum number of additional events that may be added to the current events row, during the execution of the events in that row. This entry is used in conjunction with the previous entry to determine the number of columns in the list.

d) This entry indicates the type of sort to be performed on the current events row, prior to the execution of any events scheduled to occur at the current time.

Q.4 Enter the total number of information links used in this simulation.

---

†The CDC 6400 word has 60 bits, therefore, is used to store 5 activity codes/subcodes in each word of the events list.

Q.5 Enter the total number of distribution parameter sets.

Q.6 Enter the total number of user distributions.

Q.7 Enter the total number of Markov matrices to be read in (not used in the current version).

Q.8 Enter the total number of activities in this simulation.

Q.9 This part deals with the error processing. CYSDEM allows the user to specify up to 70 errors. The first 41 errors are predefined in the system and are listed in Appendix 1. The remaining 29 errors may be defined by the user and used in various parts of the user supplied coding, as explained in Appendix 2. Upon the detection of an error, the action taken by the simulator is controlled by the error code. The error code, for each error is specified by the user.

Error code 0 - ignore this error, proceed.

Error code 1 - Non-fatal error, print an error message and proceed.

Error code 2 - Fatal error, print a message and halt.

Q.10 The purpose of this part is to relate the 16 event codes to the activity codes of the CYBERSTRUCTURE. Normally, there will be a one to one correspondence.

3.2 Periodic Data File Initialization Sheet

One of these sheets is required for each periodic data file in the system. It contains data required to initialize the values in each interval of the file. It also contains some local file parameters. There are two versions of this sheet. The first is used to initialize single entry files (Figure 4.12), the second for double entry files (Figure 4.13). The second sheet is used in conjunction with file type 4, other than that, both require exactly the same entries. The sheet for single entry files will be used for the following explanation. This sheet is made up of four major parts:

Q.1 a) Enter the number of intervals in the file. i.e., No. of CAI's + No. of HAI's.

b) Enter the file identification number.

c) Enter the subscript values. Note that one of these sheets is required for each change in subscripts. If the file is not subscripted (second and third dimensions are 1), then enter zeros.

Q.2 This part contains the initial values to be stored in the CAI's and HAI's. Each line corresponds to an interval. Therefore, the number of lines entered must be equal to the entry in a) of part 1. It is possible to initialize everything to zeroes and let the simulator store the appropriate values

CYSDEM

STATE FILE DATA INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE _____ OF _____

FILE NAME _____

DATE ___/___/___
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = [01 03]

b FILE IDENTIFICATION NUMBER = [73 76]

c SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I= [77 78] J= [79 80]

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS =

	FILE RECOGNITION TIME			GARBLED VALUE									NON-GARBLED VALUE												NUMBER OF ENTRIES					FILE IDENT. NUMBER				I SUB-SCRIPT		J SUB-SCRIPT	
Col / Card	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		73	74	75	76	77	78	79	80
01																																		
02																																		
03																																		
04																																		
05																																		
06																																		
07																																		
08																																		
09																																		
10																																		
11																																		
12																																		
13																																		
14																																		
15																																		
16																																		
17																																		
18																																		
19																																		
20																																		

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

EXPONENTIALLY SMOOTHED VALUES

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a AVERAGE RECORD TIME TO FILE ACCESS / RECOGNITION TIME [1 4]

b COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME [5 7]

c CURRENT INTERVAL TIME OF FIRST HAI [8 11]

d MONITOR CODE (0-NO, 1 - YES) [12]

e ACTIVITY CODE [13 14]

f ACTIVITY SUB CODE [15 17]

ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED

g ACTIVITY TRIGGER LAG TIME (RELATIVE TO ESTIMATED FRT) [18 20]

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R.J.W.

Fig. 4.12.

CYSDEM
STATE DATA FILE INITIALIZATION FORM
FOR DOUBLE ENTRY FILES

PAGE _____ OF _____

FILE NAME _____

DATE ____/____/____
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS= [ ]

b. FILE IDENTIFICATION NUMBER= [01 03] (73–76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I= [ ] (77–78) J= [ ] (79–80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS:

	FILE RECOGN TIME	GARBLED MEAN	NON GARBLED MEAN	NUMBER OF ENTRIES	GARBLED STANDARD DEVIATION	NON GARBLED STANDARD DEVIATION	FILE-IDENT. NUMBER	I SUB	J SUB
col	1 2 3	4 5 6 7 8 9 10 11 12	13 14 15 16 17 18 19 20 21	22 23 24 25	26 27 28 29 30 31 32 33 34	35 36 37 38 39 40 41 42 43	73 74 75 76	77 78	79 80
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES:

EXPONENTIALLY SMOOTHED VALUES [ ] (ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE RECORD TIME TO FILE ACCESS/RECOGNITITION TIME [ ] (1–4)

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME [ ] (5–7)

c. CURRENT INTERVAL TIME OF FIRST HAI [ ] (8–11)

d. MONITOR CODE (0-NO, 1-YES) [ ] (12)

e. ACTIVITY CODE — ENTER 0'S IF NO ACTIVITY [ ] (13 14)

f. ACTIVITY SUB-CODE — TO BE TRIGGERED [ ] (15–17)

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO ESTIMATED FRT) [ ] (18–20)

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R.J.W.

Fig. 4.13.

as the simulation progresses in time. However, this approach will increase the transient time of the system, besides the activities may not be able to handle zero values, which will cause errors. Each line requires these entries:

1) In the first 3 columns, enter the access time of this interval.
2) Enter the initial recorded/true values, each in 9 digits.
3) Enter the number of postings made to this interval that caused the initial recorded/true values to be there. The simulator is not sensitive to this entry and may be assumed zeroes for all CAI's.
4) Finally, enter the file ID and subscripts as in Part 1 of this sheet.

For more details, refer to the initialization of the production distribution system of Chapter 6.

Q.3 Enter the exponentially smoothed values. In the first three columns enter the access time (000 may be used).

Q.4 This part defines the following 7 local parameters:

a) This is the average difference between the access time and the interval time at each push-down of the file. The following calculation is used

to determine this entry:

Max. (Link lag - 0.5 * Interval width)

Calculated, for each storage link and the maximum is considered.

b) This entry is used as the base in calculating the above average. This entry should be set to one.

c) This entry establishs the base for calculating the interval times. Enter the upper limit of the first HAI. This entry is used to align this data file with other data files in time. If this data file is the one that has the largest (No. of HAI's * Int. width), then this entry would be the starting time minus 1, as shown in Figure 4.14.

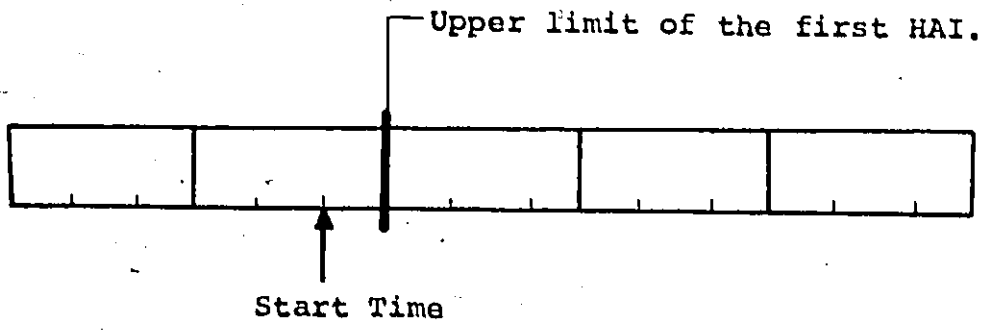


Fig. 4.14

d) This entry is the monitor code which indicates:

(a) If trace information for this file is to be printed.

(b) If intervals from this file should be saved on a disc file for later analysis.

0 - No trace information printed and no intervals are saved.

1 - Each new posting to the file will cause the printing of the values posted, access time, interval time, current time, event code of the activity that caused this posting and the values stored in the first HAI.

2 - As (1) in addition, the various values in the first HAI are stored on the disc file.

3 - Each push-down only, will cause the printing of trace information as in (1) and the first HAI will be stored on the disc file.

4 - Each push down will cause the printing of a message that has the same format as (1).

e) This entry and the next two entries are used if each new posting to this file will trigger

an activity, as shown in Figure 4.15.

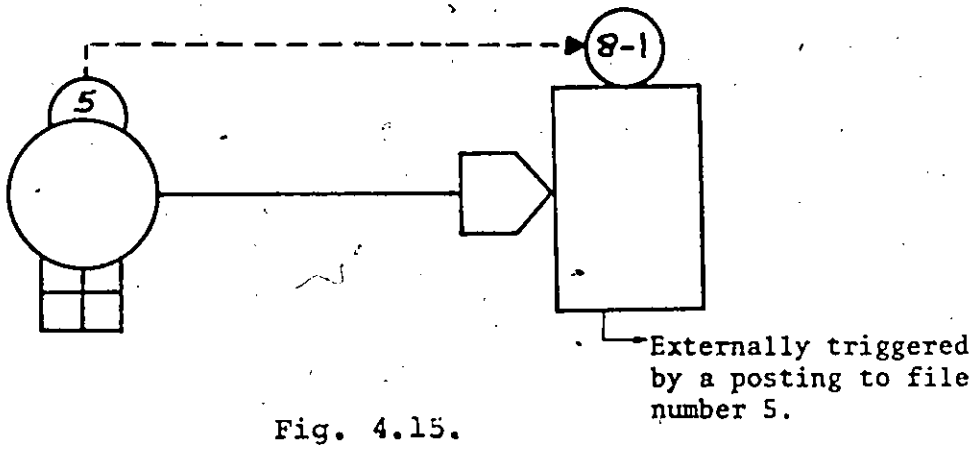


Fig. 4.15.

In this case, enter the activity code, otherwise enter zeroes.

f) Enter the subcode of the externally triggered activity, if any.

g) Enter the lag in STU's between the time of the new posting to the file and the triggering time of the activity if any.

3.3 Transaction Values Initialization Sheet

This sheet is optional. It is used to initially create any number of transactions and place them on specified queues. The sheet is shown in Figure 5.16. Each transaction is entered on one line. The line is made up of the following entries:

CYSDEM

TRANSACTION VALUES INITIALIZATION FORM

DATE ___/___/___

RUN T ____ (77–80)

One transaction per card specifying .... 1) String number (S),

2) Event sequence code (e.g. 1,2,3,etc.) (C), 3) Time at which value is available to event activity (TA),

4) True value/garbled value pairs (in sequence to the number specified for the string (VALUE 1, ... VALUE M),

5) Any parameter values (VALUE M+1 .... VALUE N).

(Note : Decimal points assumed as indicated unless decimal point is punched)

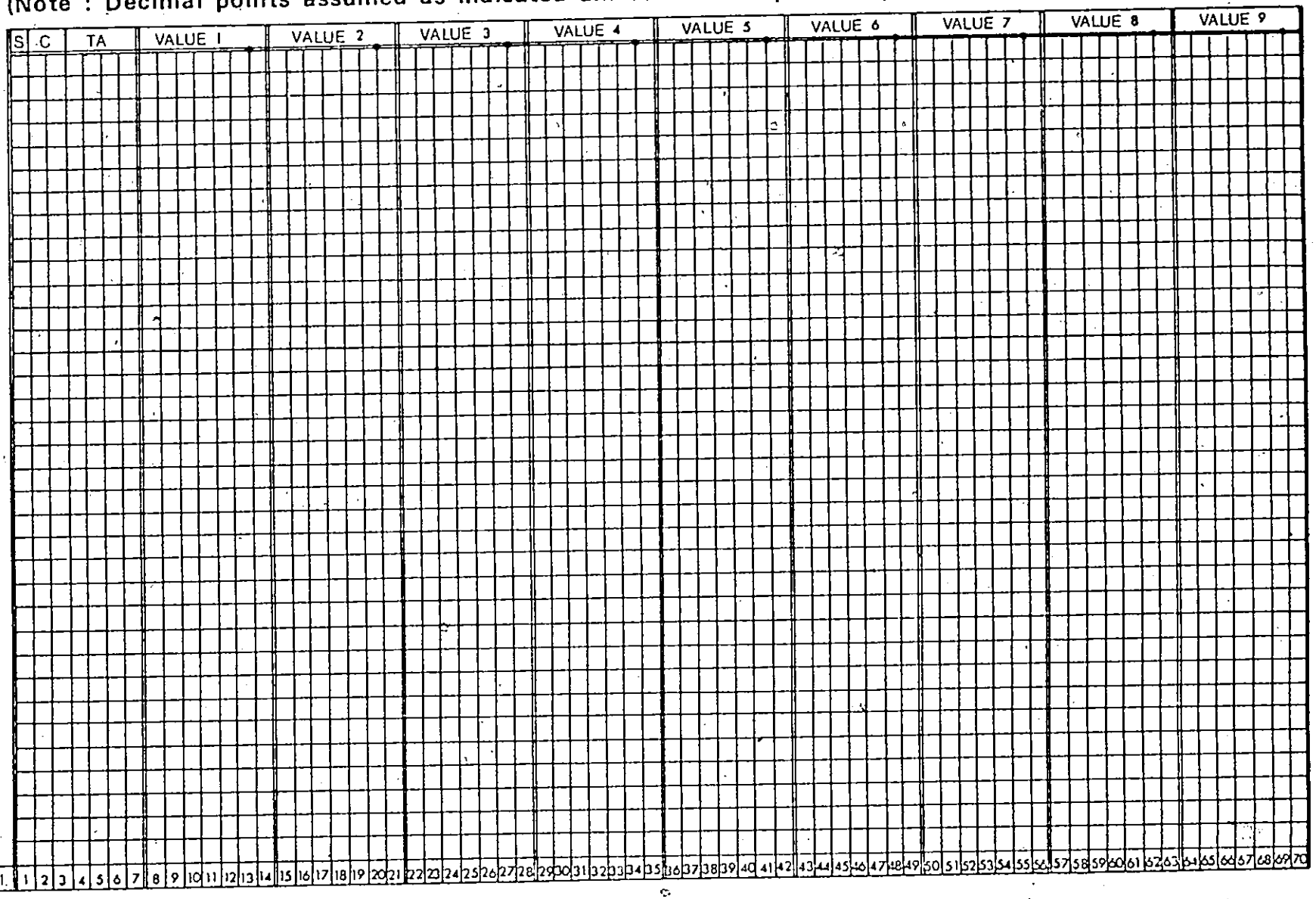


Fig. 4.16.

S — Enter one digit representing the number of the string associated with this transaction.

C — This entry is used to position this transaction on the specified string. Enter the number of the queue on which this transaction is initially waiting.

AT — Enter the access time of this transaction.

VALUE — Nine entries are available for values and parameters. Each value requires a pair of entries, the true and the recorded values, respectively. Followed by an entry for each parameter.

3.4 Event Table Initialization sheet

One of these sheets is required for the simulation. It is used to initialize the events list. All activities that are periodically or self or randomly triggered must appear on the sheet. The sheet is shown in Figure 5.17 and it is filled according to the following rules:

1. Each row contains events that will be triggered at a specific value of the clock. Enter enough rows such that each periodically or self or randomly triggered activity has at least one entry in the sheet. Normally the number of rows entered will be less or equal to the entry in Q.3.a of the simulator initialization sheet.

PAGE ...OF.....
DATE ___/___/___
RUN I.D.# ____ (73–76)

CYSDEM EVENT FILE DATA INITIALIZATION FORM

	EVENT TIME			ACTIVITY 1				ACTIVITY 2				ACTIVITY 3				ACTIVITY 4				ACTIVITY 5				ACTIVITY 6				ACTIVITY 7				ACTIVITY 8				ACTIVITY 9				ACTIVITY 10				LINE NUMBER			
				CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE		CODE		SUBCODE					
COL.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53		77	78	79	80

INSTRUCTIONS. 1) ENTER DATA IN ORDER OF ASCENDING CHRONOLOGICAL TIME AS LEFT TO RIGHT, TOP TO BOTTOM

2) FOR EACH NEW EVENT TIME, BEGIN NEW LINE

3) PLACE ALL 8's IN CODE AND SUBCODE FIELD IF SEQUENCE OF ACTIVITIES FOR A PARTICULAR TIME DOES NOT END WITH ACTIVITY FIELD 10

4) PLACE ALL 0's IN THE TIME FIELD TO INDICATE END OF EVENT DESCRIPTION RECORDS

Fig. 5.17.

2. The first row contains the activities that will be triggered at IBEG. Each following row is one STU greater than the preceeding row.

3. Each row requires the following entries:

   a) The clock time

   b) Up to 9 activity codes/subcodes that will be triggered at this clock time.

   c) The row is terminated with an entry of '88888'.

4. No need to make an entry for a clock time, if no activities are initially associated with this clock time.

5. A row with only '000' in the clock time must follow the last row in the events list.

CHAPTER 5

SIMULATION USING THE CYSDEM SIMULATOR

1. Introduction

The objective of this chapter is to show how to build the CYSDEM computer model given that the CYBERSTRUCTURE has been set up and the corresponding specification and initialization sheets have been filled.

Simulation using CYSDEM is performed by using two sets of FORTRAN† program segments. The elements of these two sets are highly interdependent.

- The first set is an established CYSDEM library. This library contains a group of subroutines that assist in performing any simulation and is independent from particular CYBERSTRUCTURES. For example, subroutines to handle the events list, the data links and the data sets.
- The second set, which reflects the particular CYBERSTRUCTURE under consideration and is supplied by the user.

---

†All CYSDEM subprograms are in FORTRAN, except one library subroutine is written in CDC COMPASS.

2. Construction of the Data Deck

The data cards deck is created from the specification and initialization sheets. The card presentation sequence shown in Figure 5.1 is to be followed. Any optional sheets may be omitted, providing they don't have a corresponding entity in the CYBERSTRUCTURE.

3. The System Chart of the Simulation Process

Figure 5.1 shows the various computer runs that are required to simulate a system, using CYSDEM.

4. The User Supplied Program Modules

CYSDEM is an open-ended simulator in the sense that the user must supply a few program modules, besides the CYSDEM library, to perform the simulation. Generally, the user supplies the following:

1) The data deck.
2) A main program (CYSRPT) which reads the input data deck and validates it.
3) A main program (CYSIM) which simulates the system, in conjunction with a user supplied subroutine, named USER.
4) The subroutine USER, which is made up of a variable number of coding segments. Each coding segment has a unique number that corresponds to an activity.

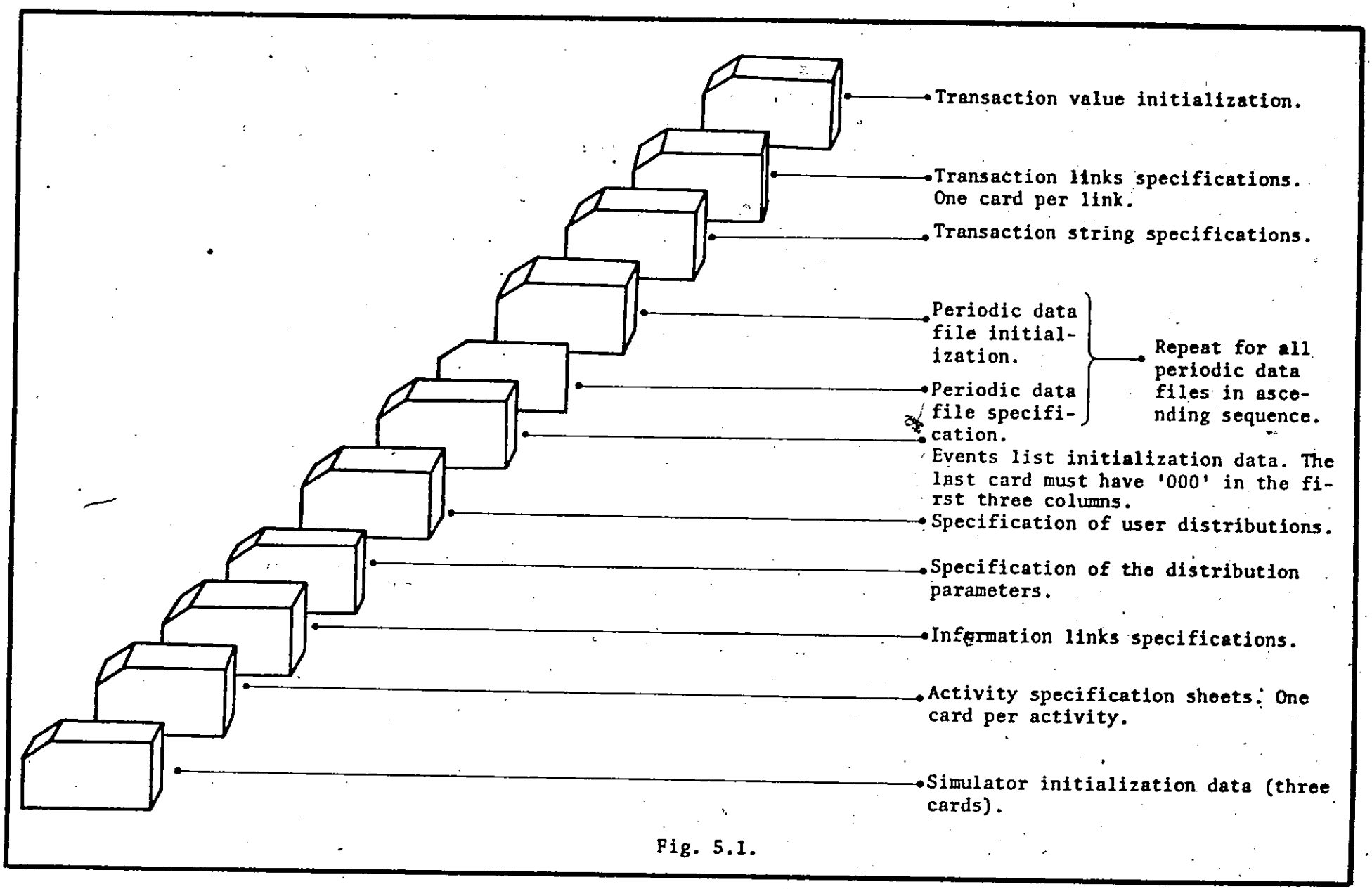
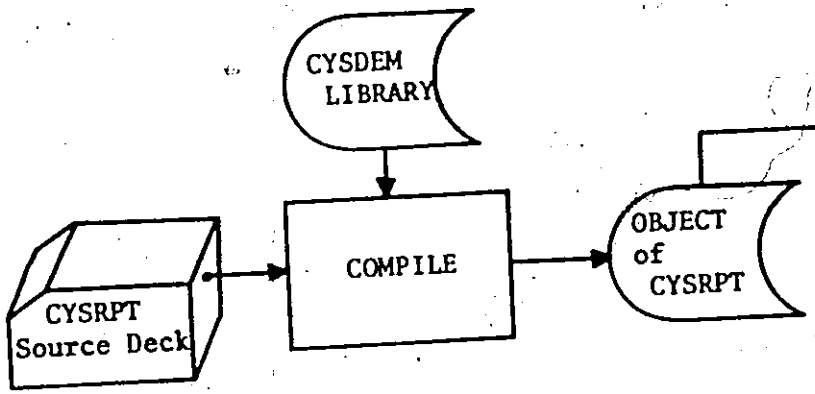

Transaction value initialization.
Transaction links specifications. One card per link.
Transaction string specifications.
Periodic data file initialization.
Periodic data file specification.
Repeat for all periodic data files in ascending sequence.
Events list initialization data. The last card must have '000' in the first three columns.
Specification of user distributions.
Specification of the distribution parameters.
Information links specifications.
Activity specification sheets. One card per activity.
Simulator initialization data (three cards).

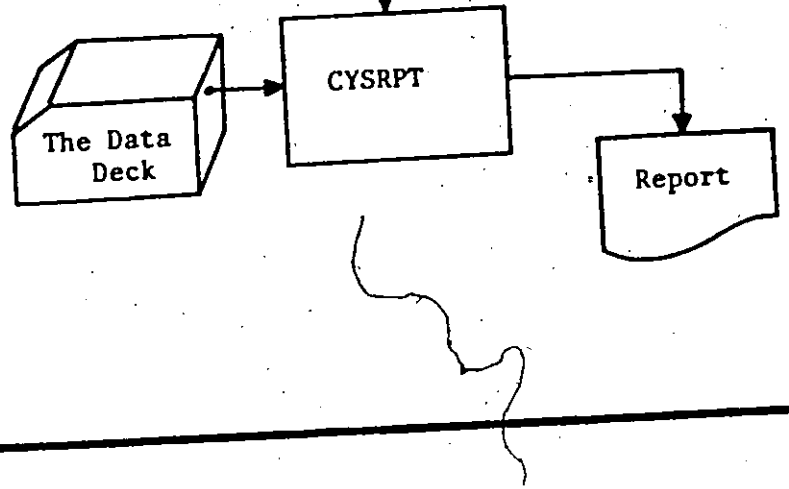
Fig. 5.1.

1 COMPILATION OF CYSRPT



CYSRPT is a user written program which CALLs various subroutines from the CYSDEM library. The FORTRAN compiler is used to compile the program.

2 EXECUTION OF CYSRPT



The function of CYSRPT is to validate the specification and initialization data (The data deck). CYSRPT produces a report that shows the contents of the data deck. Error messages are printed on the report if any errors were detected.The errors must be corrected before any further processing.

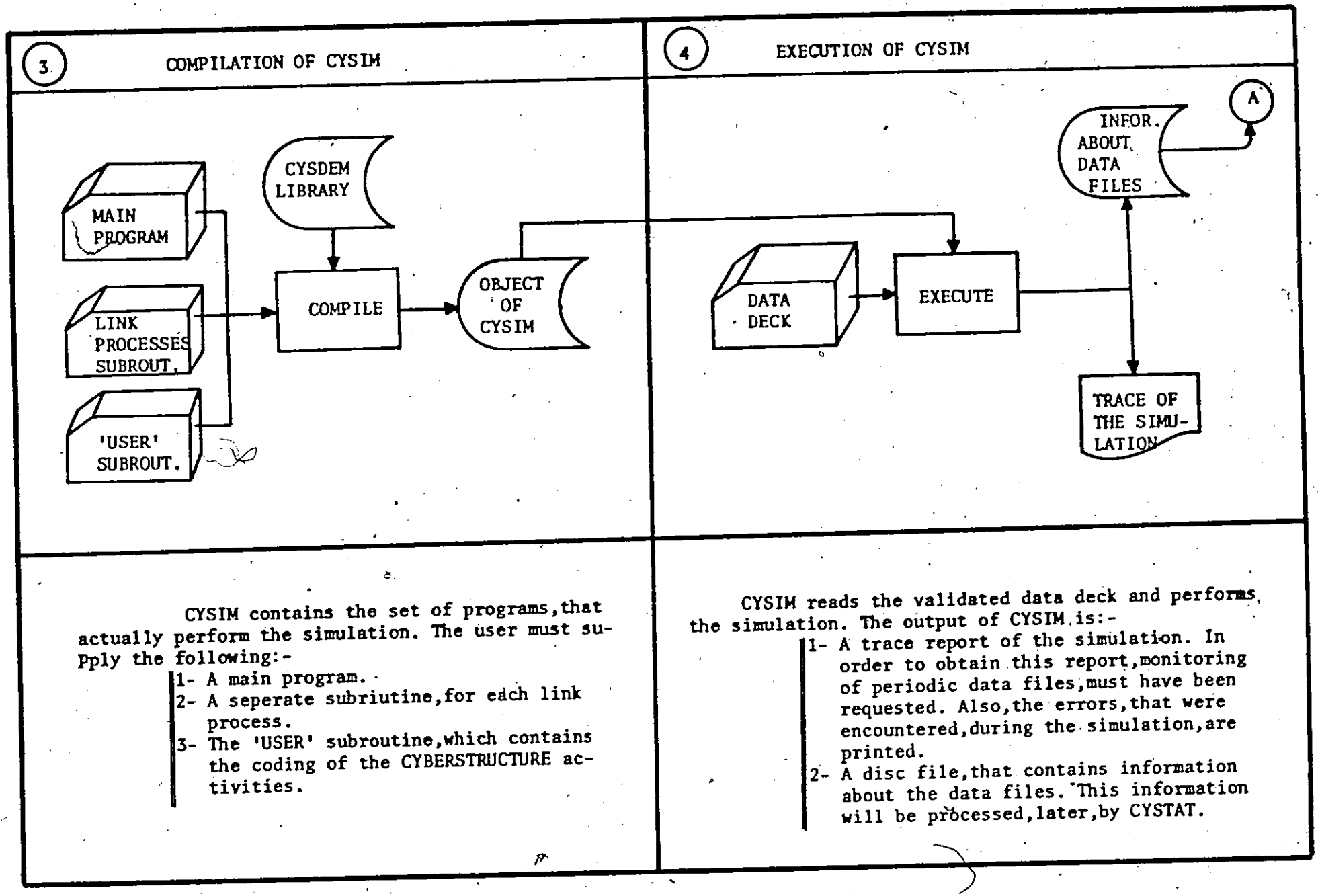

3
COMPILATION OF CYSIM
MAIN PROGRAM
LINK PROCESSES SUBROUT.
'USER' SUBROUT.
CYSDEM LIBRARY
COMPILE
OBJECT OF CYSIM
4
EXECUTION OF CYSIM
DATA DECK
EXECUTE
INFOR. ABOUT DATA FILES
A
TRACE OF THE SIMU-LATION
CYSIM contains the set of programs, that actually perform the simulation. The user must supply the following:-
1- A main program.
2- A seperate subriutine, for each link process.
3- The 'USER' subroutine, which contains the coding of the CYBERSTRUCTURE activities.
CYSIM reads the validated data deck and performs the simulation. The output of CYSIM is:-
1- A trace report of the simulation. In order to obtain this report, monitoring of periodic data files, must have been requested. Also, the errors, that were encountered, during the simulation, are printed.
2- A disc file, that contains information about the data files. This information will be processed, later, by CYSTAT.

Fig. 5.2.(cont.)

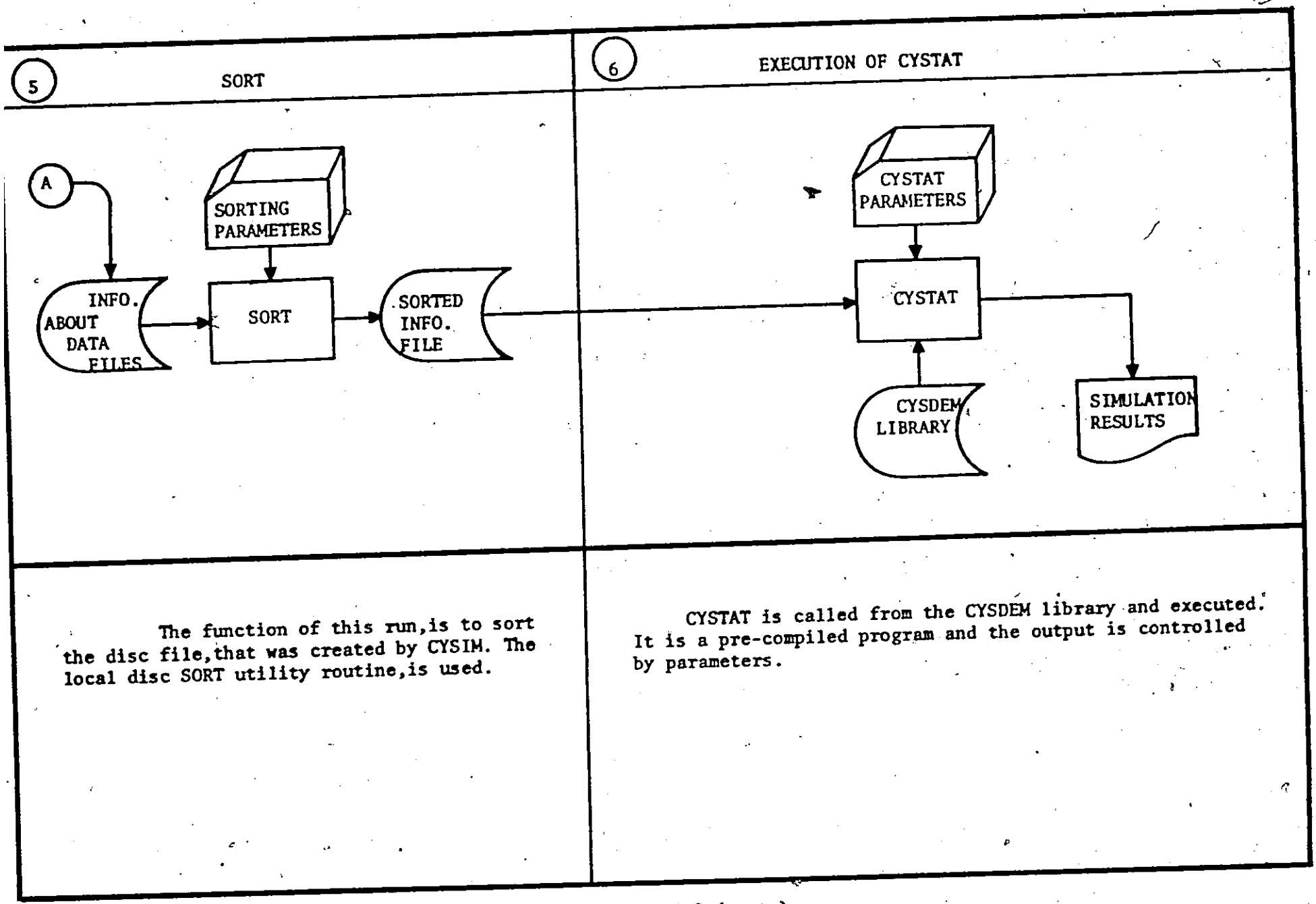

5
SORT
A
SORTING PARAMETERS
INFO. ABOUT DATA FILES
SORT
SORTED INFO. FILE
6
EXECUTION OF CYSTAT
CYSTAT PARAMETERS
CYSTAT
CYSDEM LIBRARY
SIMULATION RESULTS
The function of this run,is to sort the disc file,that was created by CYSIM. The local disc SORT utility routine,is used.
CYSTAT is called from the CYSDEM library and executed. It is a pre-compiled program and the output is controlled by parameters.

Fig. 5.2.(cont.)

5) One subroutine for each link process in the system.

6) A main program (CYSTAT) which analizes the data created by CYSIM and produces time plots and statistical information to measure the performance of the system.

4.1 Explanation of the COMMON variables

COMMON variables are used as interface buffers to transfer data between the main programs and the CYSDEM library subroutines. Each related set of variables is grouped in a COMMON block. The following is a description of these blocks:

1) COMMON/GMP/INOW,IEND,IAC,IASC,IBEG,ILT

INOW - current clock time

IEND - clock time, at which the simulation will end

IAC - code of the current activity

IASC - subcode of the current activity

IBEG - beginning clock time

ILT - duration of the current activity

This block is used to report any of the above variables to the main programs.

2) COMMON/ERR/E1,E2,E3,E4

This block is required if the user CALLS the ERROR subroutine from one of the three main programs. The

use of the ERROR subroutine is explained in Appendix II.

3) COMMON/SVAL/SGVL,SVL,ISX, JSX,IDI,ISRC

This block is used as a buffer to store data, that was created by a process, in the appropriate periodic data file. The user is concerned only with the following variables, which should be set by the user prior to initiating the storage data link, as explained in the next section of this chapter.

SVL - The process output, i.e., the posted true value.

ISX,JSX - The subscripts of the data file. Appropriate values must be assigned to ISX, JSX only if the file is subscripted.

4) COMMON/RVAL/RGVL1,RGVL2,IRT,IAT,RVL1,RVL2,NRE,IRC

This block is used as a buffer to transfer an interval from a periodic data file to the requesting activity. After initiating the retrieval data links, the following values will be available to the requesting activity:

RGVL1 - The recorded value or, the recorded mean for double entry files.

RGVL2 - The recorded standard deviation for double entry files only.

IRT - The interval time of the retrieved interval.

IAT - The access time of the retrieved interval.

RVL1 - The true value or, the true mean for double entry files.

RVL2 - The true standard deviation, for double entry files only.

NRE - The up-to-date number of postings to this interval.

5) COMMON/TVL/ITA,TVL(m),TGVL(m),TP(n),ITRC

This block is used to transfer the contents of a transaction data set from a queue to the requesting activity. In the COMMON statement, m and n must be initially set to the maximum number of values and parameters, respectively. After initiating the retrieval transaction link as shown in the next section, the following is available to the requesting activity:

ITA - The access time of the retrieved data set.

TVL(m) - The set of true values in the data set. TVL(1) is the first true value and so forth.

TGVL(m) - The set of recorded values in the data set.

TP(n) - The set of transaction parameters. The first parameter is TP(1) and so on.

ITRC - A return code which may be:

0 - A transaction is available for the activity.

1 - the queue is empty.

2 - The queue is not empty, however, the oldest transaction has an access time greater than the activity initiation time.

6) COMMON/RINF/ITR,IRX,JRX

This block transfers information to the data link retrieval routines. The user does not handle this block.

ITR - The relative recency of retrieval.

IRX,JRX - Like ITR, used in conjunction with subscripted files.

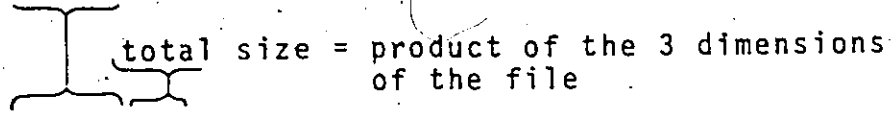
7) COMMON/CVLS/GVL1,VL1,IDC,LM

This block is used only if an activity calculates it's own duration, as explained in activity number 3 in the Production - Distribution system of Chapter 6. If an activity calculates its own duration then GVL1,VL1 and ILT (of the COMMON block GMP) must be set to the calculated duration, prior to the initiation of any storage data links.

8) COMMON/NBL/TNBL(m),GNBL(m)

This block is used if an activity is triggered by the detection of a negative balance condition, on a level periodic data file.

9) A memory area is reserved for the periodic data files by using a COMMON statement as shown in the following example:




```
COMMON RFUOL(120),RFWDM(25),RFTSM(21),RFINV(137),DIUOL(153),
1DIWDM(37),DISSM(21),DIINV(169),FAUOL(169),FAWDM(33),FACSM(21),
2FAINV(249)
```

- In CYSRPT, only the COMMON block for the periodic data files is needed.

- CYSIM which is composed of the following three modules:

  1) The main program which requires the COMMON block for the data files and the block GMP.
  2) The subroutine USER, which requires all the COMMON blocks.
  3) A subroutine for each process. The COMMON blocks needed, depend on the function of the link process. The name of the link process must be declared as an EXTERNAL in the beginning of USER because it is referenced from it.

- CYSTAT does not require any COMMON blocks.

The above will be clarified in the following sections.

4.2 Storage and Retrieval of Data from Data Sets

Initiation of data links for storage and retrieval purposes is implemented in the coding module of the process by using the FORTRAN CALL statement. The CYSDEM library subroutine called depends on the type of the data set referenced. Also, on whether data is posted to or retrieved from the data set. Table 5.1 shows the possible CALL formats. The following are examples on data storage and retrieval.

Example 1

To retrieve the most current available HAI from the DEMAND periodic data file using link 25. DEMAND is not subscripted.

```
ITR = 0
CALL RLK(25,DEMAND,1)
RDEM = RGVL1
TDEM = RVL1
```

- RDEM will contain the value of the recorded demand.
- TDEM will contain the value of the true demand.

Example 2

The amount of goods to be delivered to the customers of a shop has just been calculated by an activity. This amount is drawn from the inventory of the shop which is represented by a level file named INV. The activity is connected to INV by link 10.

INITIATION TYPE	SIMPLE OR MACRO	FORMAT OF THE FORTRAN CALL	R E M A R K S
Retrieval from periodic data files.	Simple	CALL RLK(m,xxxxxx,n)	m= The initiated link number. xxxxxx= The periodic data file name. n= Number of subscripts,of the data file. yyyy= The name of the link process. The retrieved interval,is available to the requesting activity,via the COMMON block RVAL. Prior to initiating the link,the user must set the variable ITR,of the COMMON block RINF.
	Macro	CALL RLNK(m,yyyy,xxxxxx,n)	
Storage in periodic data files	Simple	CALL SLK(m,xxxxxx,n)	m,n,xxxxxx,yyyy are the same,as above. Prior to initiating the link,the variable SVL must be set to the value,to be posted to the file.
	Macro	CALL SLNK(m,yyyy,xxxxxx,n)	
Retrieval of a transaction,from a queue.	Simple	CALL TRLK(k,s,q)	k= The number of the initiated link. s= The transaction string number. q= The queue number. yyyy= The link process name. The result is in the COMMON block TVL. The return code (return flag) ITRC,must be checked,after initiating the link.
	Macro	CALL TRLNK(k,yyyy,s,q)	
Storage of a transaction,in a queue.	Simple	CALL TSLK(k,s,q)	k,s,q,yyyy are the same as above. The values, to be stored,must be in TVL(m),TGVL(m),TP(n) of the COMMON block TVL,prior to initiating the link. After link initiation,the return flag (code) must be checked. If it has a value of one,then the queue is full and the activity must take corrective action. If it has a value of zero,then ,the transaction was successfully stored.
	Macro	CALL TSLNK(k,yyyy,s,q)	

Table 5.1.

```
SVL = -AMOUNT
CALL SLK(10,INV,1)
```

The minus before AMOUNT is required because the amount is drawn down from the inventory.

Example 3

A managerial process requires the latest value of the demand which is stored in the only CAI in the demand file. The process is connected to the file by link 15 which embodies a link process PREP. This link process is to prepare the required demand value for the managerial process. Assuming that the most current available HAI is the first HAI, then the following coding will do the job.

```
ITR = -1
CALL RLNK(15,PREP,DEMAND,1)
RDEM = RGVL1
```

PREP must have been declared as an external in the beginning of the above coding module.

Example 4

To get the average of the first three most current available HAI's from the file of example 1.

```
SUM = 0
ITR = 1
DO 50 I = 1,3
CALL RLK(25,DEMAND,1)
```

```
50  SUM = SUM + RGVL1
    AVRG = SUM/3
```

Example 5

To store a transaction in string number 3 and queue number 10 by link number 6.

```
    TVL(1) =···   }·store the true values
    TP(1) =···    }·store the parameters
    CALL TSLK(6,3,10)
    IF (ITRC.EQ.0) GO TO 20
                  }·action to be taken when the queue is full
20  --------      }·normal return and the transaction is stored
```

4.3 The Validation Program CYSRPT

The function of this main program is to validate the data deck and print its contents on a report. If any errors are detected in the data deck, appropriate messages are also printed.

The COMMON block of the periodic data files must

exist in CYSRPT.

CYSRPT is made up of a sequence of CALLs to CYSDEM library subroutines. These subroutines are selected according to the types of entities that are described in the data deck. Table 5.2 shows these subroutines and their functions. Figure 5.3 shows the CYSRPT that was used in the production - distribution system of Chapter 6. The output report is shown in Chapter 7.

SUBROUTINE NAME	FUNCTION
VRSG1	To read and report the following: 1) Simulator initialization data 2) Activity specification data 3) Information link specification data 4) Distribution parameter set specification data 5) User distribution specification data
EVIN	To read the event file initialization data
VRSG2	To report on what was read by EVIN
FDTIN	To read the periodic data file specification and initialization data
VRSG3	To report on what was read by FDTIN
VRSG4	To read and report on transaction entities

Table 5.2.

Note that if the system does not have any transaction entities then no need to call VRSG4. Also, note that VRSG2 and VRSG3 may be called from any where in

CYSIM to report, at any time, the contents of the events file and the periodic data files, respectively.

```
 COMMON REUOL(129),REWOM(25),RETSM(21),REINV(137),DIUOL(153),
1DIWOM(37),DISSM(21),DIINV(169),FAUOL(169),FAWOM(33),FACSM(21),
2FAINV(249)

 CALL VRSG1
 CALL EVIN
 CALL VRSG2
 CALL FDTIN(REUOL)
 CALL VRSG3(REUOL)
 CALL FDTIN(REWOM)
 CALL VRSG3(REWOM)
 CALL FDTIN(RETSM)
 CALL VRSG3(RETSM)
 CALL FDTIN(REINV)
 CALL VRSG3(REINV)
 CALL FDTIN(DIUOL)
 CALL VRSG3(DIUOL)
 CALL FDTIN(DIWOM)
 CALL VRSG3(DIWOM)
 CALL FDTIN(DISSM)
 CALL VRSG3(DISSM)
 CALL FDTIN(DIINV)
 CALL VRSG3(DIINV)
 CALL FDTIN(DIINV)
 CALL VRSG3(DIINV)
 CALL FDTIN(FAUOL)
 CALL VRSG3(FAUOL)
 CALL FDTIN(FAWOM)
 CALL VRSG3(FAWOM)
 CALL FDTIN(FACSM)
 CALL VRSG3(FACSM)
 CALL FDTIN(FAINV)
 CALL VRSG3(FAINV)
 STOP
 END
```

Fig. 5.3.

4.4 The Simulation Modules

These modules perform the actual simulation. The output of these modules are:

1) A disc file. The records of this file are intervals from periodic data files that have a monitor code of 2 or 3 as previously explained. If all the data files have a monitor card other than 2 or 3, then the disc file is not created.

2) If monitoring of a periodic data file has requested a print out then a report is printed. This report enables the user to trace the execution of the program. The report is shown in Chapter 7.

The simulation modules are constructed as shown:

4.4.1 Construction of the Subroutine USER

Each activity is implemented in CYSDEM by a coding segment in the subroutine USER. Eacn segment has a unique number, identical to the activity number in the CYBER-STRUCTURE. When control is transferred to USER, the code/subcode of the activity to be initiated is in the variables IAC/IASC of the COMMON block GMP. The first executable statement in USER must be a computed GO TO statement. This is used to transfer control to the appropriate coding segment, depending on the value of IAC. An example of the construction of USER is shown in Figure 5.4. Note that any link processes that are referenced from USER, must be declared as an EXTERNAL.

4.4.2 Construction of the Subroutines for the Link Process

A separate subroutine for each link process in the CYBERSTRUCTURE is required. The name of the subroutine must be identical to the name of the link process. These subroutines must be declared as EXTERNALS in USER. Figure 5.5 shows the construction of the link process subroutine.

```
      SUBROUTINE USER
C.....THE FOLLOWING COMMON BLOCKS ARE ALWAYS NEEDED:-
      COMMON/GMP/INOW,IEND,IAC,IASC,IBEG,ILT
      COMMON/ERR/E1,E2,E3,E4
      COMMON/SVAL/SGVL,SVL,ISX,JSX,IDT,ISRC
      COMMON/RVAL/RGVL1,RGVL2,IRT,IAT,RVL1,RVL2,NRE,IRC
      COMMON/RINF/ITR,IRX,JRX

C.....THE FOLLOWING COMMON BLOCK IS NEEDED,IF NEGATIVE BALANCE
C.....ACTIVITIES,WERE SPECIFIED FOR DATA FILES:-
      COMMON/NBL/TNBL(50),GNBL(50)

C.....THE FOLLOWING COMMON BLOCK IS NEEDED,IF TRANSACTION ENTITIES
C.....EXIST IN THE SYSTEM:-
      COMMON/TVL/ITA,TVL(3),TGVL(3),TP(3),ITRC

C.....THE FOLLOWING COMMON BLOCK IS NEEDED,IF AN ACTIVITY
C.....DETERMINES IT'S OWN DURATION:-
      COMMON/CVLS/GVL1,VL1,IDC,LN

C.....INSERT HERE THE COMMON BLOCK,THAT DEFINES THE DATA FILES,
C.....THE FOLLOWING IS AN EXAMPLE:-
      COMMON REUOL(129),REWDM(25)

C.....INSERT HERE THE APPROPRIATE EXTERNAL STATEMENTS,IF LINK
C.....PROCESSES,WERE SPECIFIED:-
      EXTERNAL PREP

C.....THE FOLLOWING IS THE FIRST EXECUTABLE STATEMENT IN THIS
C.....SUBROUTINE.IT TRANSFERS CONTROL TO THE APPROPRIATE ACTIVITY.
      GO TO (1,2,3,4,.....) IAC

   1                  }
                      }
                      }  CODING OF THE FIRST ACTIVITY
                      }
                      }
      RETURN          }

   2                  }
                      }
                      }  CODING OF THE SECOND ACTIVITY
                      }
      RETURN          }
      .
      .
      .
      .
      .
```

Fig.5.4.

```
      SUBROUTINE PREP
C.....COMMON BLOCKS FOR THE PERIODIC DATA FILES
      COMMON REUOL(129),PEWDM(25),.....

C.....INCLUDE ANY OTHER COMMON BLOCKS,AS REQUIRED BY THE
C.....CODING OF THE LINK PROCESS.


C.....IF ANY LINK INITIATED IN THIS LINK PROCESS EMBODIES
C.....ANOTHER LINK PROCESS,THEN IT MUST BE DECLARED AS AN
C.....EXTERNAL
      EXTERNAL ...
      EXTERNAL...
                                  } CODING OF THE LINK PROCESS

      RETURN
      STOP
      END
```

Fig. 5.5.

4.4.3 Construction of the Main Program CYSIM

CYSIM is the main simulation program. It is a sequence of CALLs to library subroutines and the subroutine USER. The following explains the construction of CYSIM:

1) At least two COMMON blocks are required:
   a) the periodic data file COMMON block
   b) block GMP
2) A CALL to the library subroutine GMPIN to read the simulator initialization data, the activity specification data, the data links data, the distribution parameters sets and the user distributions.
3) A CALL to the library subroutine EVIN to read the events list initialization data.
4) One CALL to the library subroutine FDTIN, for each periodic data file. FDTIN reads the specification and initialization data of each data file.
5) A CALL to the library subroutine TDTIN to read the data associated with the transaction entities.
6) An IF statement to check if the current time has exceeded the simulation ending time, if so, stop the simulation.
7) A call to the library subroutine RMVEV to remove the next event from the events list.
8) A call to the library subroutine TRIG to trigger the next event and calculate its duration.
9) A call to the subroutine USER to execute the activity that corresponds to the current event.

```
      COMMON REUOL(129),REWON(29),RETSM(17),REINV(137),DIUOL(153),
     1DIWON(37),DISSM(17),DIINV(169),FAUOL(169),FAWON(33),FACSM(17),
     2FAINV(249)
      COMMON /GMP/INOW,IEND,IAC,IASC,IBEG,ILT
      CALL GMPIN
      CALL EVIN
      CALL FDTIN(REUOL)
      CALL FDTIN(REWON)
      CALL FDTIN(RETSM)
      CALL FDTIN(REINV)
      CALL FDTIN(DIUOL)
      CALL FDTIN(DIWON)
      CALL FDTIN(DISSM)
      CALL FDTIN(DIINV)
      CALL FDTIN(FAUOL)
      CALL FDTIN(FAWON)
      CALL FDTIN(FACSM)
      CALL FDTIN(FAINV)
   50 IF (INOW.GE.IEND) GO TO 100
      CALL EVENT
      WRITE (6,10) IAC,IASC
      CALL TFIG
      CALL USER
      GO TO 50
  100 WRITE (6,20)
   10 FORMAT(/,1X,10(1H*),16H ENTERING ACTIVITY ,I2,1H-,I3,10(1H*)//)
   20 FORMAT(/,1X,10(1H*),19H END OF SIMULATION ,10(1H*))
      STOP
      END
```

Fig. 5.6.

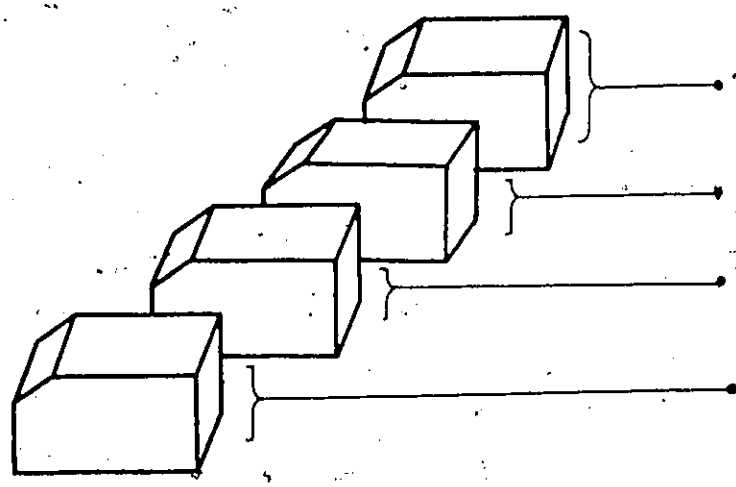


Fig. 5.7.

10) Branch to 6.

Figure 5.6 shows an example of CYSIM and Figure 5.7 shows the presentation sequence of the simulation modules.

4.5 The Sort Run

The disc file that was created by CYSIM is not sorted. To sort it, the SORT utility routine is used. The records of the disc file contain information about the intervals that existed in monitored periodic data files. This information is used by the main program CYSTAT for statistical analysis and time plots of the data images in the periodic data files. The sort parameters will vary from one computer to another. However, the sort is performed on two keys:

1) The major key is the file identification number.
2) The minor key may either be:
   a) the interval time
   b) the access time

If the minor key is the interval time, then the time plots will be referenced to the true time. On the other hand, if the minor key is the access time, then the plots will be referenced to the time when the interval was available to the system.

The format of the disc file record is shown in Figure 5.8. The sort parameters used for the CDC 6400 are shown in Chapter 6. If none of the periodic data files had a monitor code of 2 or 3 then the disc file is empty. The disc file is created by the library subroutine MONTR.

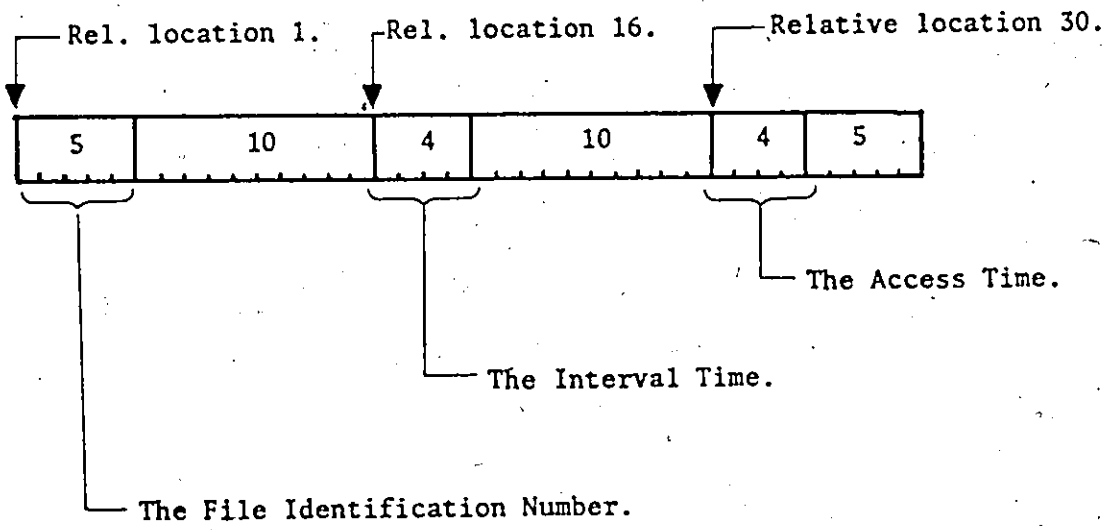


Fig. 5.8.

4.6 The Output Program CYSTAT

The function of this program is to print time plots and statistical information about the intervals of monitored

periodic data files. CYSTAT is parameter driven and does not require any coding. The sorted disc file is input to CYSTAT, together with the parameters.

The first parameter card contains the following integer entries in sequence:

Columns	Parameter
1 - 5	Number of periodic data files that will be processed by CYSTAT in this run
6 - 10	The run number

For each periodic data file that is going to be processed during this run of CYSTAT there must be one card with the following entries. All entries are five integer digits, except the second entry.

Columns	Parameter
1 - 5	Periodic data file identification number.
6 - 15	Alphanumeric description of the data file.
16 - 20	The lower time limit, used to truncate the range of records that are included in the analysis. For example, this may be used to cancel the transient effects.
21 - 25	The upper time limit.
26 - 30	The scale of the time axis of the time plots. This should be set equal to the interval width. If it is blank, one STU

	is assumed.
31 - 35	If the statistical analysis are to be broken down by event-code, then enter the highest event-code. Enter 0 to by-pass event-code breakdown.
36 - 40	Enter any integer larger than zero so that the analysis will be based on the true value. If it is zero, the analysis is performed on both the true and the recorded values.
41 - 45	Enter a non-zero integer to print the input data of this file. A zero entry will suppress this printout.
46 - 50	Enter a non-zero integer to produce the input data on punched cards. Otherwise, enter zero.
51 - 55	This is used to control the size of the time axis of the time plot. 0 - no time plots requested 8 - 8 inch plots 11 - 11 inch plots 14 - 14 inch plots
56 - 60	Enter the number of intervals in the histogram that will be printed out. This number must not exceed 20. If it is zero, no histogram is printed for this data file.

61 - 65	This is the time/value matching specifications for time plots for the combinations of the recorded value (R), true value (T), access time (A) and interval time (I). 0 - R,A and T,I 1 - R,I and T,A 2 - R,I and T,I 3 - R,A and T,A

6. Proposed Sequence and Notes on Building the Model

1) Apply systems analysis techniques to study the organization unit under consideration.

2) Determine the periodic data, transaction data and the activities.

3) Draw the CYBERSTRUCTURE. Note that there are two possible methods to represent delays in information requested by an activity:

   a) Group all the delays of the input data into the duration of the activity. The input data links will have zero lags. This results in a delay in the system's recognition of the activity output. This is poor practice because it defeats the purpose of data links.

   b) Each input link has its delay. This results in the retrieval of older values than those

retrieved by the first method.

4) Check that the CYBERSTRUCTURE operates logically. In narrative form, describe the action of each activity.

5) Fill the data links specification sheets.

6) Fill the data files specification sheets. Ensure that sufficient HAIs and CAIs exist.

7) Fill the activity specification sheet. If sorting of the current events row was requested then activities with a lower code will be triggered first. If no sorting, then FIFO mode is used.

8) Fill the specification sheets of the transaction entities.

9) Form the USER subroutine.

10) Construct the three main programs.

11) Fill the initialization sheets

12) Good Luck!

CHAPTER 6

PRODUCTION - DISTRIBUTION SYSTEM

1. Introduction

This chapter consists of an example to illustrate what was explained in the previous chapters. The CYBERSTRUCTURE building process, the use of the specification sheets and building the computer model are illustrated. The output results, from CYSDEM, are explained in Chapter 7.

A model of a production - distribution system was used. This system was taken from Forrester's 'Industrial Dynamics'. The assumptions that Forrester made in analyzing the system were used here so that the results may be compared. Forrester used the continuous simulator, DYNAMO to analyse his model.

The system as shown in Figure 6.1 is made up of three sectors:

1) The retail sector
2) The distributor sector
3) The factory sector

The function of each of the three sectors is basically the same. At the managerial level there are two processes of interest in each sector:

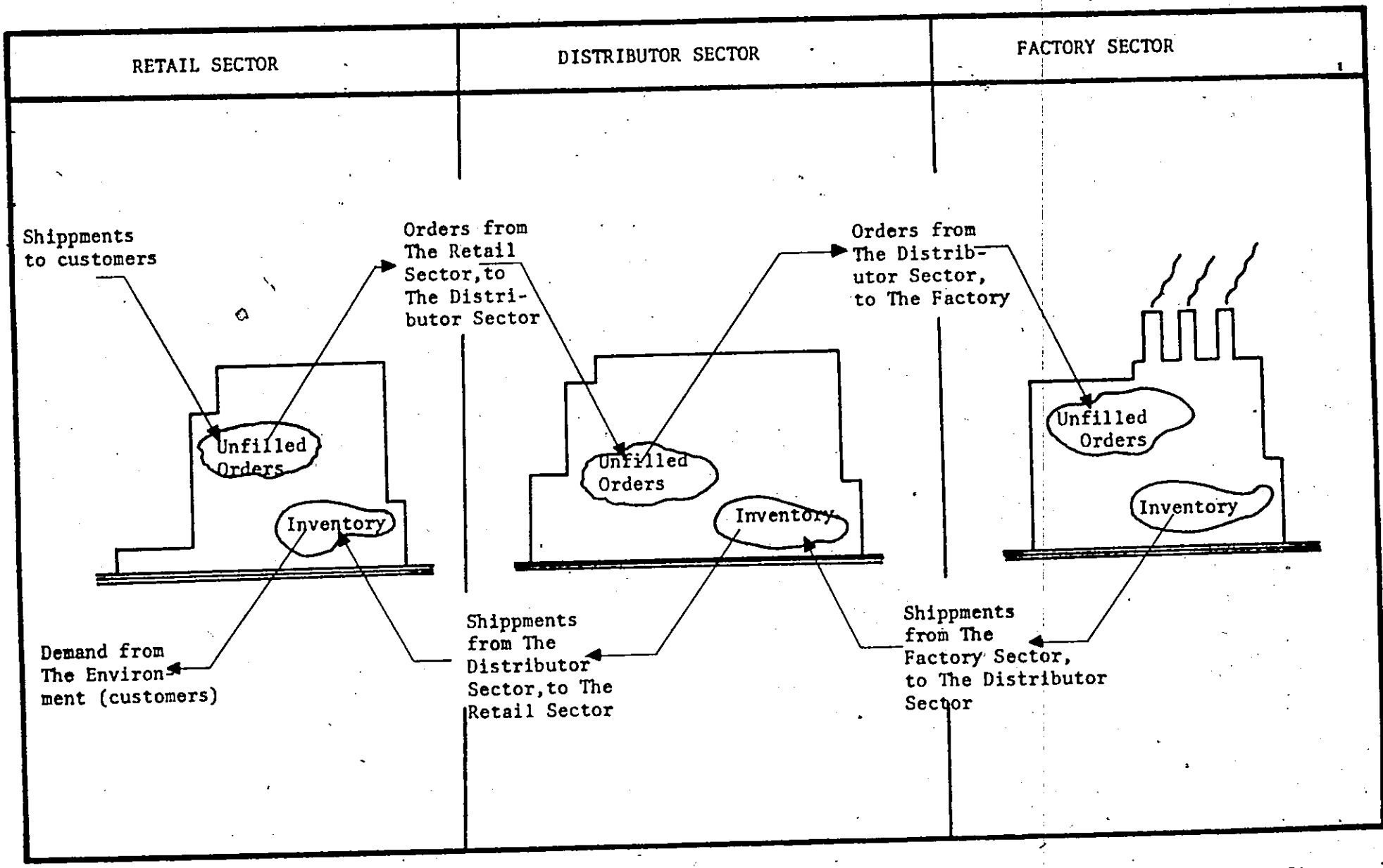

RETAIL SECTOR
DISTRIBUTOR SECTOR
FACTORY SECTOR
Shippments to customers
Orders from The Retail Sector, to The Distributor Sector
Orders from The Distributor Sector, to The Factory
Unfilled Orders
Inventory
Unfilled Orders
Inventory
Unfilled Orders
Inventory
Demand from The Environment (customers)
Shippments from The Distributor Sector, to The Retail Sector
Shippments from The Factory Sector, to The Distributor Sector

Fig. 6.1.

1) To determine the amount of goods to be shipped to the other sector. In case of the retail sector it is the amount to be shipped to the customers.
2) To determine the amount of goods to be reordered from the next sector. In case of the factory sector, it is the amount to be manufactured.

Section 2 explains the process of building the CYBERSTRUCTURE for the retail sector. The other two sectors are similar, as shown later. A simulation time unit of one working day was used.

2. The CYBERSTRUCTURE of the Retail Sector

This sector is made up of three activities and four periodic data files. Furthermore, an environmental activity to create the demand is required. This demand is used as input to the system. Without it, the system will remain idle. The following subsections explain those activities.

2.1 The Environmental Daily Demand Activity

The function of this activity is to create the daily demand. It has zero duration and is triggered daily. The daily demand value is posted to two data files:

1) The retail unfilled orders (REUOL). Each value posted by the activity is added to the current amount of unfilled orders. A level

file of interval width equal to one STU was chosen. Each interval carries the daily level of unfilled orders.

2) The retail weekly demand (REWDM). Each interval carries this week's demand. Therefore each complete interval will carry the sum of five postings, from the daily triggered activity. The interval size is five STUs and the file type is 3. When a CAI becomes a HAI, the value in it is last week's demand.

It will be assumed that the demand is recognized by the system without delay. Therefore, no link lags exist.

Figure 6.2 shows the CYBERSTRUCTURE of this activity. The number of HAIs and CAIs is explained while filling the specification sheets.

2.2 The Retail Demand Smoothing Activity

The function of this activity is to take this weeks demand and calculate the smoothed demand using the previous value of the smoothed demand. This activity is triggered at the end of the week such that the oldest CAI in file number 2 is complete making this week's demand available. The new smoothed demand is posted to the retail smoothed demand (RETSM) data file. The value posted is used to calculate the newer smoothed demand at the next triggering of the activity. The duration of the activity is zero

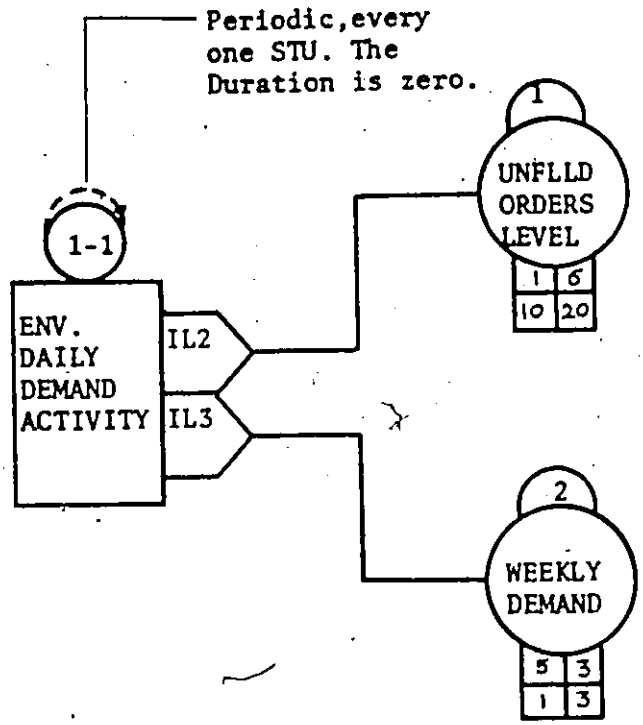

Periodic,every
one STU. The
Duration is zero.
1
UNFLLD
ORDERS
LEVEL
1 6
10 20
1-1
ENV.
DAILY
DEMAND
ACTIVITY
IL2
IL3
2
WEEKLY
DEMAND
5 3
1 3
. IL2,IL3 have no
lag or garbling.

Fig. 6.2.

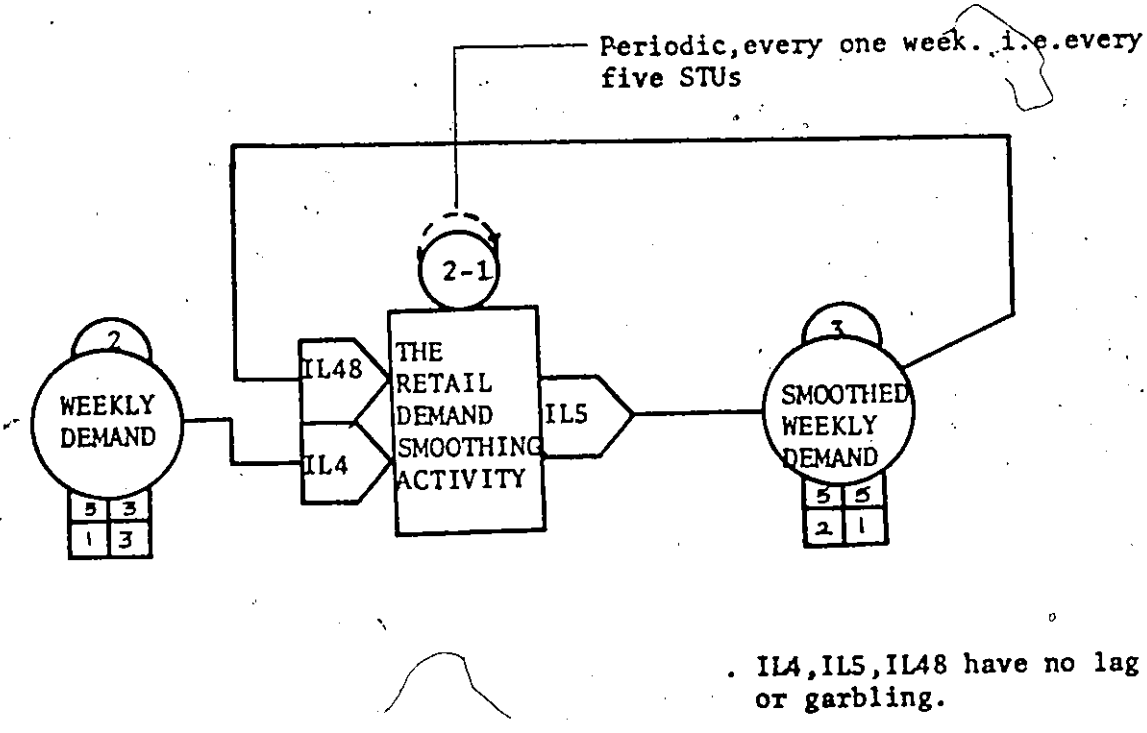

Periodic,every one week. i.e.every
five STUs
2-1
2
WEEKLY
DEMAND
5 3
1 3
IL48
IL4
THE
RETAIL
DEMAND
SMOOTHING
ACTIVITY
IL5
3
SMOOTHED
WEEKLY
DEMAND
5 5
2 1
. IL4,IL5,IL48 have no lag
or garbling.

Fig. 6.3.

because its only function is to create the smoothed demand file. A smoothed value of the rolled off HAIs exist in file number 2. However, if this file has n HAIs then the stored smoothed value is at least n weeks old. This activity will produce a more recent value, that is why it was decided to include it in the model. The smoothed demand file is of interval size of five STUs. Only one value is posted to it every week, this value replaces the older one, i.e., file type 5. The CYBERSTRUCTURE is shown in Figure 6.3 and a description of the activity follows:

1) Retrieve this week's demand from the weekly demand file. This value is in the only CAI therefore the relative recency of retrieval parameter should be set equal to -1.
2) Retrieve the previous smoothed demand value.
3) Calculate the new smoothed demand. The exponential smoothing method is used.
4) Post the new smoothed demand to the retail smoothed demand file.

2.3 The Daily Shipment to the Customers

The function of this activity is to determine the amount of goods to be shipped to the customers every day. This activity is periodically triggered every one STU. The duration of this activity is the delay in filling the customer's orders. This duration is variable and will be

calculated by the activity.

The daily amount shipped depends on:

a) The existence of an unfilled orders backlog which is represented by the unfilled orders level.

b) The existence of sufficient inventory in the retail warehouses.

The amount shipped to the customers is drawn from the inventory, which is represented by a level file of interval size of one STU. The procedure followed by Forrester is that the daily shipments is a function in the unfilled orders and the delay in filling these orders,which in turn is a function of the inventory.

$$\text{Daily shipment} = \frac{\text{The unfilled orders level}}{\text{The delay in filling orders}} \qquad (6\text{-}1)$$

The daily shipment must not be greater than the available inventory. The delay in filling the orders will now be derived as a function of the inventory.

Consider one kind of product in a single warehouse. The relation between the inventory and the ability to fill the orders is shown in Figure 6.4 (curve a). However, at the managerial level all the products in all the warehouses will be represented by the inventory level file. In this case, the relation between the total inventory and the ability to fill the orders is as shown in curve b. The

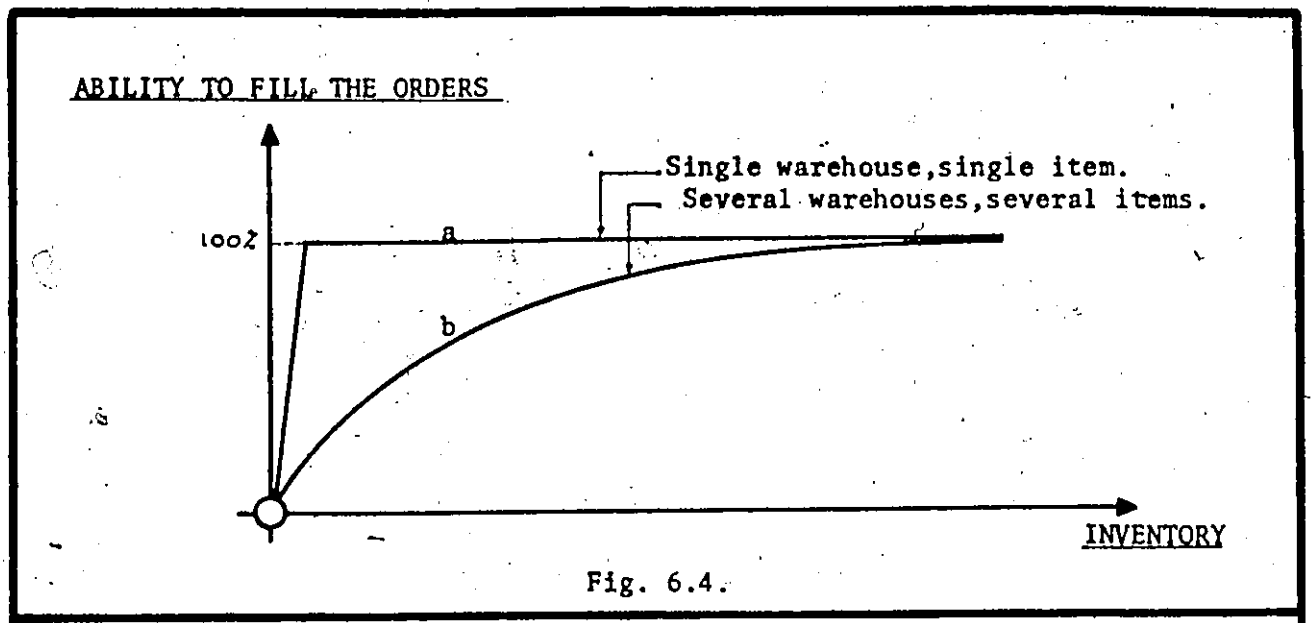


Fig. 6.4.

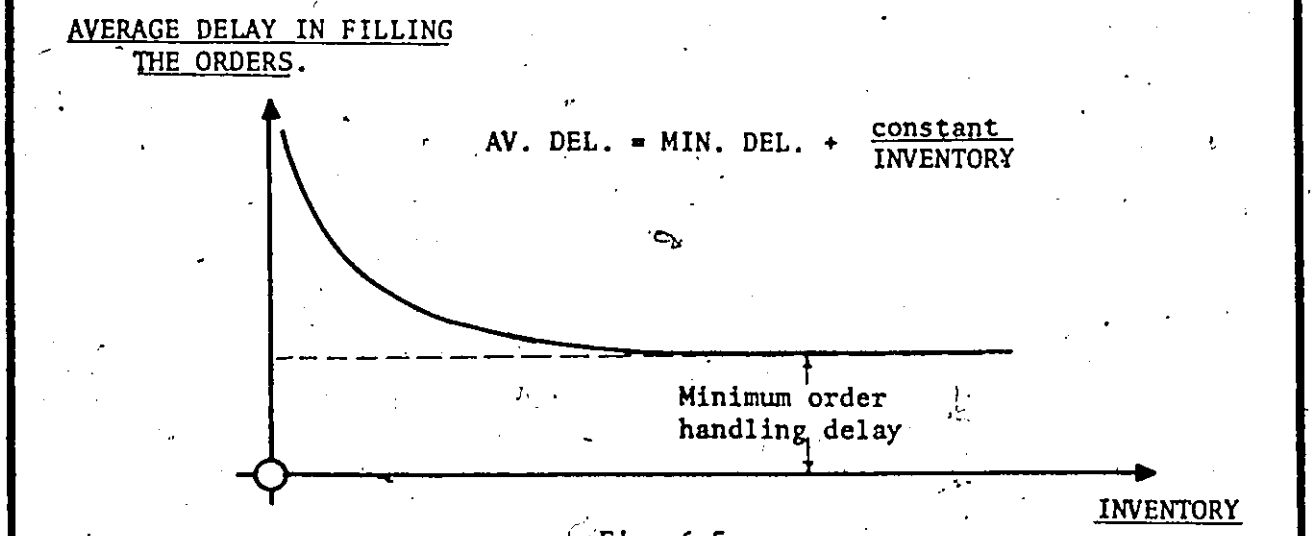


Fig. 6.5.

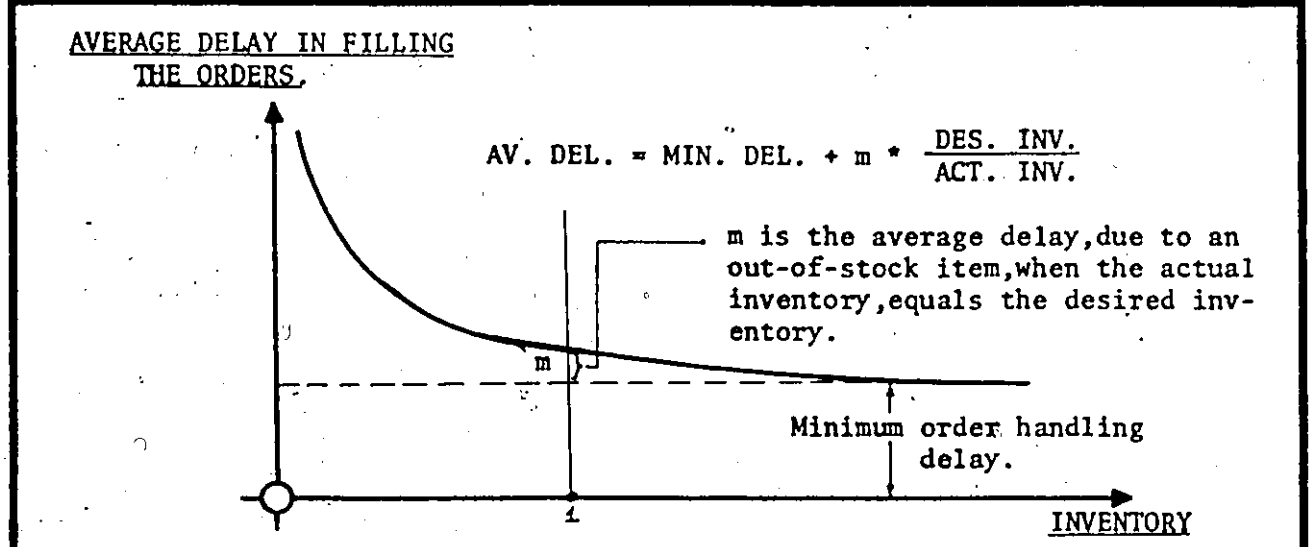


Fig. 6.6.

reason is that some items will be depleted before others and the total ability to fill the orders will decrease as the total inventory decreases.

The delay in filling the orders is inversely related to the ability to fill the orders. Therefore, the relation shown in Figure 6.5 must exist between the inventory and the average delay in filling the orders. This relation is satisfied by the equation:

$$\text{Average delay} = \text{Min. delay} + \frac{\text{Constant}}{\text{Inventory}} \qquad (6\text{-}2)$$

It is better to use the non-dimensional term (desired inventory/actual inventory), instead of the inventory term. The desired inventory is a reference, to compare against it the actual inventory.

$$\therefore \text{Average delay} = \text{Min. delay} + m * \frac{\text{desired inventory}}{\text{actual inventory}} \qquad (6\text{-}3)$$

Where m is the average delay due to an out-of-stock item when the actual inventory equals the desired inventory. The desired inventory is calculated using (6.4):

$$\text{Desired inventory} = \text{constant} * \text{smoothed weekly demand} \qquad (6\text{-}4)$$

Where the constant is the number of weeks that the desired inventory could supply the average sales rate, this constant is 8,6,4 weeks for the retail, the distributor and the factory sectors respectively.

The CYBERSTRUCTURE is shown in Figure 6.7. IL 6,7,8,9,10 have no lags, nor garbling. Note that the lags of the output links (IL 9,10) could have been set equal to the minimum delay of (6.3). In this case, the duration of the activity would be the second term of (6,3).

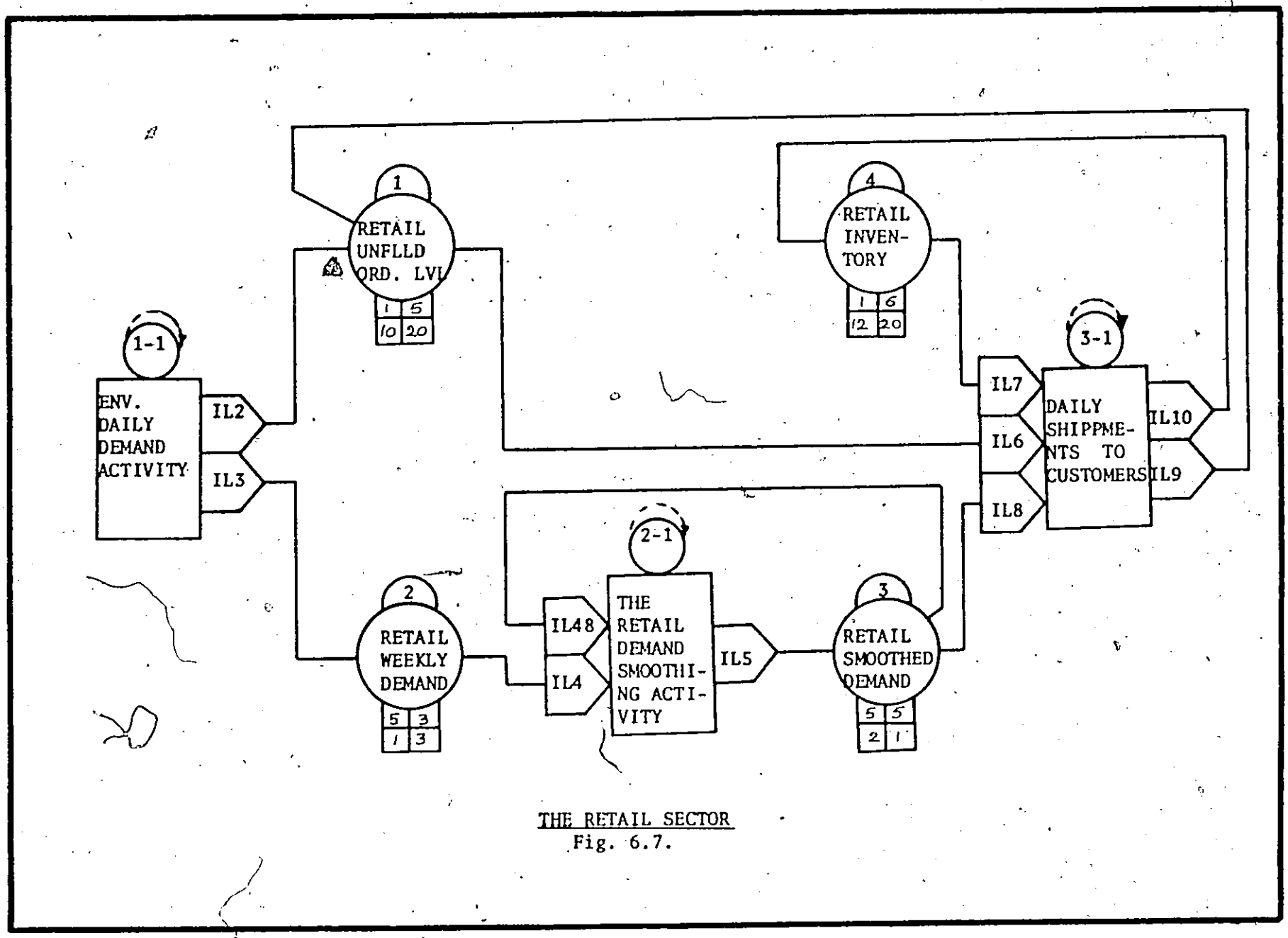
The following is a sequenced description of the activity:

1) Retrieve the smoothed demand
2) Calculate the desired inventory using (6.4)
3) Retrieve the actual inventory.
4) Calculate the average delay using (6.3).
5) Set the duration of the activity.
6) Retrieve the unfilled orders.
7) Calculate the daily shipment using (6.1)
8) Check that sufficient inventory exists.
9) Decrease the unfilled orders level and the inventory level by the amount shipped.

2.4 The Retail Weekly Purchase Activity

The function of this activity is to determine the amount of goods to be reordered from the distributor sector. This activity is triggered at the end of each week. The duration is three weeks (15 STUs). The model was built such that the weekly reorder amount is a function of:

1) This week's demand
2) The difference between the actual and the desired inventories.



THE RETAIL SECTOR
Fig. 6.7.

3) The difference between the actual and the desired contents of the pipelines between the retail and the distributor sectors.

4) The difference between the actual and the normal unfilled orders at the retail.

i.e., Reorder amount = weekly demand + $\frac{1}{\text{retail adjustment delay}}$

[(desired weekly inventory - actual weekly inventory)

+ (actual unfilled orders - normal unfilled orders)

+ (desired pipeline contents - actual pipeline contents)] (6-5)

If any difference between the terms in the inner brackets exist, then a correcting component will appear in the reordered amount where:

- the normal unfilled orders level = the smoothed demand

  * Normal delay in filling orders at the retail sector (6-6)

- The desired pipeline contents is the product of the weekly demand and the total time required for an order to travel around the supply circuit.

i.e., the desired pipeline contents = the smoothed demand *

[Delay in clerical processing at retail. This is the duration of the re-order activity, i.e. 3 weeks

⊕

The mail delay from the retail to the distributor, which is three STUs.

⊕

The delay in filling the retail orders at the distributor. This is the duration of the distributor's shipping activity. An average value based on the assumption that the actual and the desired distributor inventories are equal is considered.

⊕

The delay in transporting the goods from the distributor to the retail].

- The actual pipeline contents is the amount of goods in the retail supply circuit. This amount is calculated as follows:

[The orders that have been placed by the retail but still in clerical processing at the retail. This is due to the duration of the retail purchasing activity. Since this duration is three weeks then the amount that is in clerical processing at the retail is the sum of the three latest reordered amounts that were calculated by this activity.

⊕

The orders that are in the mail from the retail to the distributor. Note that due to the duration of the retail purchasing activity the orders that are in the mail today are those that were placed four weeks ago, multiplied by the mail delay (1/2 week).

⊕

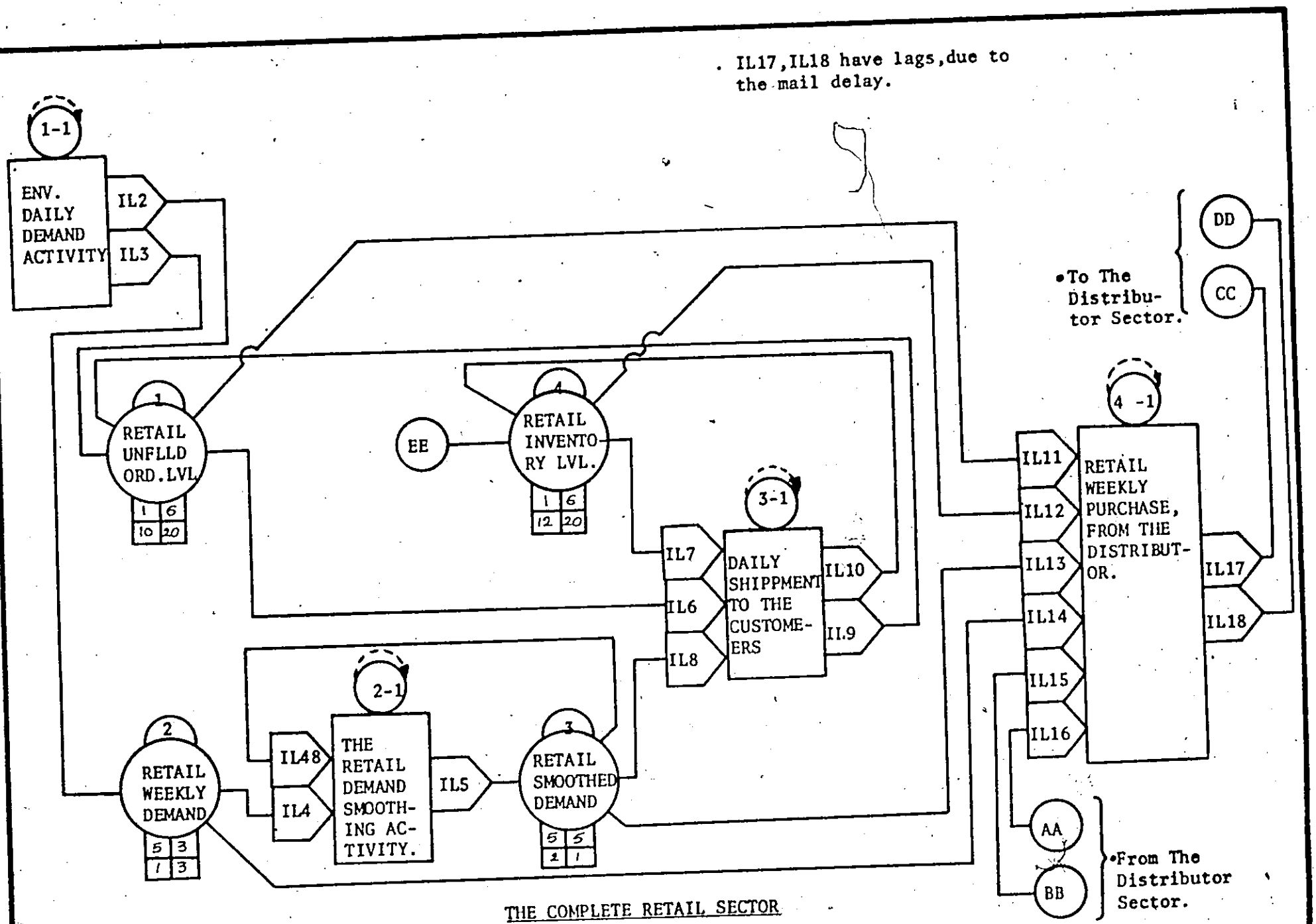
The distributor unfilled orders backlog.

⊕

The goods in transit from the distributor to the retail. The transportation delay is five STUs. Taking the duration of the distributor shipping activity into consideration (an average of 1.6 weeks, i.e., 8 STUs) then the amount in transit is the sum of the last five shipments in the latest thirteen distributor shipments to the retail.

The following is a sequenced description of the activity. The complete CYBERSTRUCTURE of the retail sector is shown in Figure 6.8.

1) Retrieve this week's demand
2) Retrieve the smoothed retail demand
3) Calculate the desired inventory using (6.4).
4) Retrieve the retail inventory.
5) Retrieve the retail unfilled orders



THE COMPLETE RETAIL SECTOR

Fig. 6.8.

6) Calculate the normal unfilled orders using (6.6)

7) Calculate the actual pipeline contents

8) Calculate the desired pipeline contents

9) Calculate the re-order amount using (6.5)

3. The CYBERSTRUCTURE of the Distributor Sector

The distributor sector operates in the same manner as the retail sector. Therefore, both sectors have similar CYBERSTRUCTURES. The only differences are:

1) The distributor demand is created by the retail reorder activity.

2) The delays and the constants are different (see system parameters in Table 6.1).

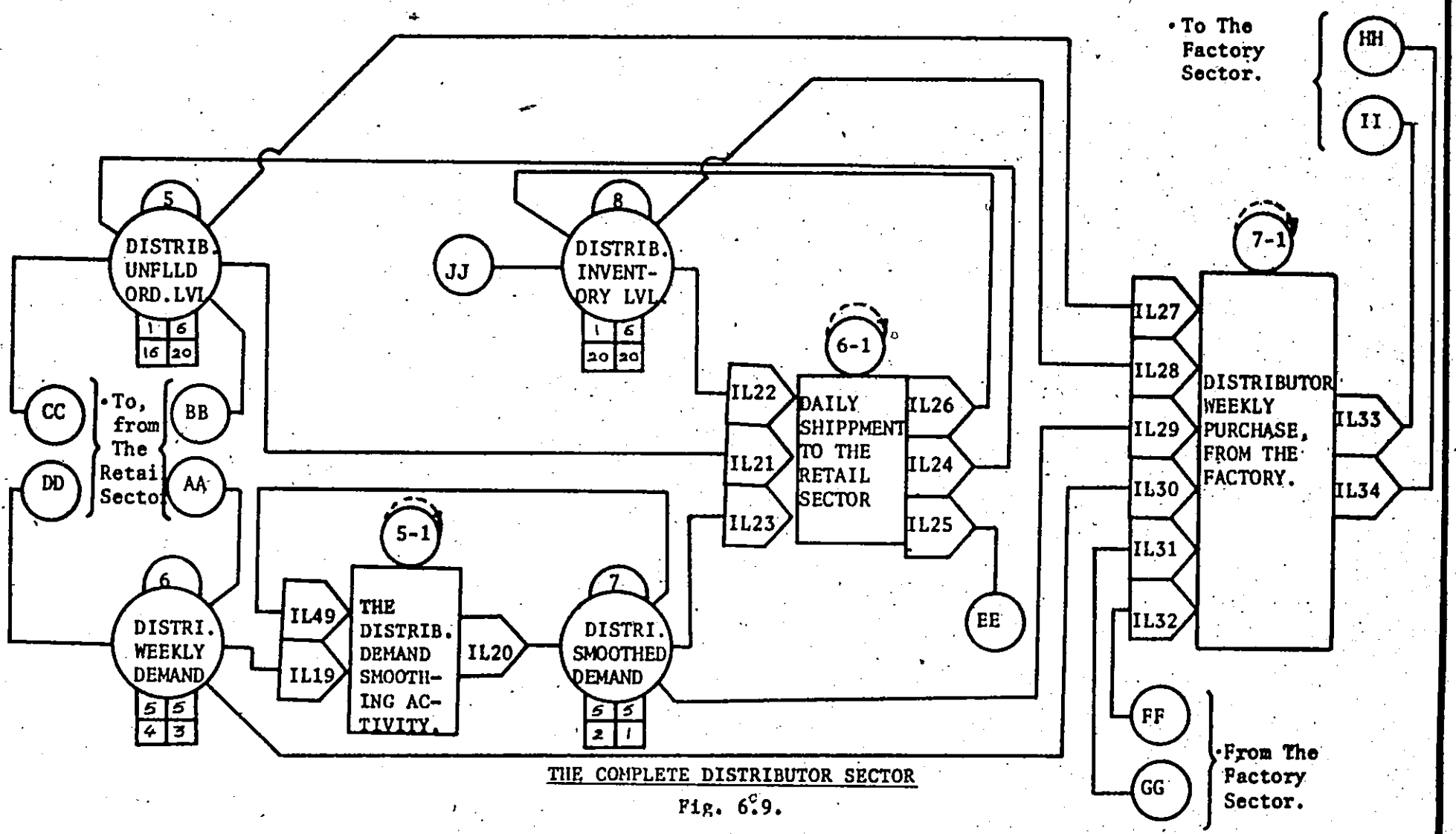
3) In the distributor shipping activity, an extra link exists (IL 25) to post the amount shipped from the distributor to the retail inventory data file. This link has a lag due to the transportation delay.

The CYBERSTRUCTURE of the distributor sector is shown in Figure 6.9.

4. The CYBERSTRUCTURE of the Factory Sector

The function of this sector is to satisfy the distributor's orders and to determine the amount to be manufactured. These functions are accomplished by three

. IL25,has a lag,due to the transportation delay.
. IL32,IL33 have lags,due to the mail delay.



THE COMPLETE DISTRIBUTOR SECTOR

Fig. 6.9.

activities:

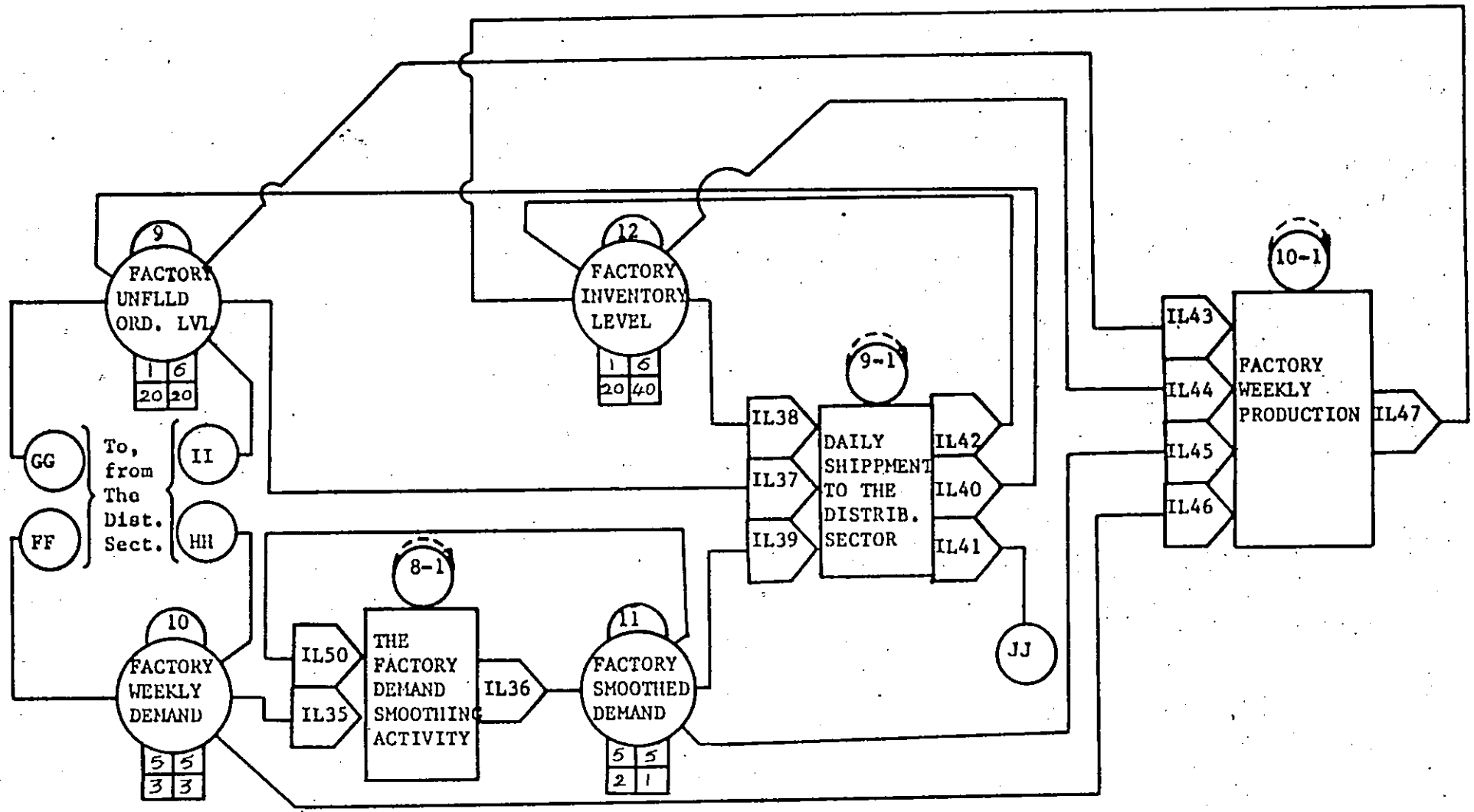
1) The factory demand smoothing activity
2) The shipping activity
3) An activity to determine the amount to be manufactured

The first two activities operate in exactly the same manner as those of the other two sectors. The third activity is triggered at the end of each week. It has a duration of one week due to the clerical processing delay. The manufacturing process itself takes six weeks. The amount to be manufactured is determined using equation (6.5) except that some of the terms in the R.H.S. are calculated in a different manner than those of the retail sector. This is due to the following two assumptions:

1) Assume that there is no mail or transportation delay between the factory and it's warehouse.
2) The desire to produce more than the factory capacity will lead to maximum factory output. This capacity is specified as one of the system parameters. The availability of men, machines and materials are recognized in the factory capacity.

- The desired pipeline contents: This represents the desired orders in transit to the factory and is equal to:

. IL41 has a lag, due to the transportation delay.
. IL47 has a lag, due to the production process.



THE COMPLETE FACTORY SECTOR
Fig. 6.10.

The smoothed factory demand

⊛

[The clerical processing delay, i.e., one week

⊕

The production process delay i.e., six weeks]

- The actual pipeline contents: This is equal to

  The manufacturing orders that are still in clerical processing. The clerical processing delay is one week. Therefore the last amount ordered is still in clerical processing.

  +

  The orders that are being manufactured. This is equal to the sum of the amounts ordered in the last six weeks of the previous seven weeks.

The CYBERSTRUCTURE of the factory sector is shown in Figure 6.10. The next step is to fill the specification sheets and code the activities. The delays and parameters that were used by Forrester are used here and are shown in Table 6.1.

5. The Specification Sheets

   The inforamtion data links were specified using the long form as shown in Figure 6.11. Each link is specified on a row instead of using the form in Figure 4.4.

THE PARAMETERS OF THE PRODUCTION-DISTRIBUTION SYSTEM

PARMETER		SECTOR		
		RETAIL WKS	DISTRIB. WKS	FACTORY WKS
Minimum order handling delay		1	1	1
Delay in filling the orders,due to an out-of stock item,when The Actual Inventory equals The Desired Inventory.		0.4	0.6	1
The proportionality constant between The Desired Inventory and The Smoothed Demand.		8	6	4
The Smoothing Time Delay,used to calculate The Smoothed Demand.		8	8	8
The Adjustment Time Delay,of equation (6-5).		4	4	4
The clerical delay,in processing The Purchase Orders. This is the duration of the re-order activity.		3	2	1
The delay,due to the production process.		—	—	6
The manufacturing capacity,of The Factory Sector.		—	—	1000 units/ week
The mail delay	From The Retail to The Distributor Sectors.	0.5		
	From The Distributor to The Factory Sectors.	0.5		
The Trasportation Delay	From The Distributor to The Retail Sectors.	1		
	From The Factory to The Distributor Sectors.	2		

Table 6.1.

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Date 1/12/74

CYSDEM

INFORMATION LINK PROCESSING SPECIFICATION FORM

INFORMATION LINK NUMBER	LAC TIME	HAI STORAGE	STOC PROC CODE	PARAM CODE FOR b, σ	U/L BND CODE	RSLT OF PROC CD	PARAM SET, USER DIST OR MXVP	MODIFIER (BND) TO BE USED AS b+BND*σ	DATA CORRECTION FACTOR FOR ADJUSTING GARBLED TO TRUE	UP-DATE CODE	RUN NUMBER (NOT REQ'D)	I.D.
COL 1 2 3 4	5 6	7	8	9 10	11	12	13 14	15 16 17 18 19 20	21 22 23 24 25	26	73 74 75 76	77
0 0 0 2	0 0									0		L
0 0 0 3	0 0									0		L
0 0 0 4	0 0									0		L
0 0 0 5	0 0									0		L
0 0 0 6	0 0									0		L
0 0 0 7	0 0									0		L
0 0 0 8	0 0									0		L
0 0 0 9	0 0									1		L
0 0 1 0	0 0									1		L
0 0 1 1	0 0									0		L
0 0 1 2	0 0									0		L
0 0 1 3	0 0									0		L
0 0 1 4	0 0									0		L
0 0 1 5	0 0									0		L
0 0 1 6	0 3									0		L
0 0 1 7	0 3									1		L
0 0 1 8	0 0									0		L
0 0 1 9	0 0									0		L
0 0 2 0	0 0									0		L
0 0 2 1	0 0									0		L
0 0 2 2	0 0									0		L
0 0 2 3	0 0									0		L
0 0 2 4	0 0									1		L
0 0 2 5	0 5									1		L
0 0 2 6	0 0									1		L
0 0 2 7	0 0									0		L
0 0 2 8	0 0									0		L
0 0 2 9	0 0									0		L
0 0 3 0	0 0									0		L
0 0 3 1	0 0									0		L

Fig. 6.11.

Page 2 of 2
Date 1/12/74

CYSDEM
INFORMATION LINK PROCESSING SPECIFICATION FORM

INFORMATION LINK NUMBER	LAG TIME	HAI STORAGE	STOC PROC CODE	PARAM CODE FOR μ, σ	U/L BND CODE	RSLT OF PROC CD	PARAM SET, USER DIST OR MKV#	MODIFIER (BMD) TO BE USED AS μ+BMD*σ	DATA CORRECTION FACTOR FOR ADJUSTING GAR-BLED TO TRUE	UP-DATE CODE	RUN NUMBER (NOT REQ'D)	I.D.
COL 1 2 3 4	5 6	7	8	9 10	11	12	13 14	15 ... 20	21 22 23 24 25	26	73 74 75 76	77
0 0 3 2	0 0									0		L
0 0 3 2	0 3									1		L
0 0 3 4	0 3									0		L
0 0 3 5	0 0									0		L
0 0 3 6	0 0									0		L
0 0 3 7	0 0									0		L
0 0 3 8	0 0									0		L
0 0 3 9	0 0									0		L
0 0 4 0	0 0									0		L
0 0 4 1	1 0									1		L
0 0 4 2	0 0									1		L
0 0 4 3	0 0									1		L
0 0 4 4	0 0									0		L
0 0 4 5	0 0									0		L
0 0 4 6	0 0									0		L
0 0 4 7	0 0									0		L
0 0 4 8	0 0									1		L
0 0 4 9	0 0									0		L
0 0 6 0	0 0									0		L
												L
												L
												L
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												L
												L
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												L
												L
												L
												L
												L

Fig. 6.11(cont.).

RUN NUMBER E (73 . . . . 77)

DATE 1/1/75

C Y S D E M

PERIODIC DATA FILE PARAMETER SPECIFICATION FORM

1. FILE IDENTIFICATION NUMBER (II) 0002 (1 4)

2. ALPHANUMERIC DESCRIPTION OF FILE (FNM) WKLY DMNDR (5 14)

3. FILE TYPE (IFT) 5 (15)

   1 - LARGEST VALUE OVER INTERVAL
   2 - SMALLEST VALUE OVER INTERVAL
   3 - SUM OVER INTERVAL
   4 - STATISTICAL (MEAN, STD. DEVIATION)
   5 - REPLACEMENT VALUE
   6 - CUMULATIVE SUM (LEVEL)

4. INTERVAL SIZE OF FILE IN STU'S (INTS) 0005 (16 19)

5. FILE DIMENSION SIZES

   (a) SIZE OF FIRST DIMENSION (L) (PLEASE REFER TO MANUAL TO SPECIFY THIS VALUE) 025 (20 22)

   (b) SIZE OF SECOND DIMENSION (M) (ENTER 01 IF NO SECOND DIMENSION) 01 (23 24)

   (c) SIZE OF THIRD DIMENSION (N) (ENTER 01 IF NO THIRD DIMENSION) 01 (25 26)

6. NUMBER OF CURRENT ACCUMULATION INTERVALS (NCA) 001 (27 29)

7. NUMBER OF HISTORIC ACCUMULATION INTERVALS (NHA) 003 (30 32)

8. SMOOTHING FACTORS FOR END VALUES

   (a) ALPHA FOR RECORDED VALUE(S) (A1) 0.100 (33 35)

   (b) ALPHA FOR TRUE VALUE(S) (A2) 0.100 (36 38)

9. MAXIMUM STORE-AHEAD OF INOW (IN STU'S) (MSA) 0005 (39 42)

10. FOR LEVEL FILES, IS A NEGATIVE BALANCE PERMITTED?

    IF YES, SPECIFY EVENT CODE AND SUB-CODE NUMBER AND EVENT RECOGNITION DELAY TIME FOR THE ACTIVITY WHICH HANDLES THE NEGATIVE BALANCE PROCESSING

    IF NO (OR N/A) ENTER ZEROES:

    (a) EVENT CODE 00 (43 44)

    (b) EVENT SUB-CODE 000 (45 47)

    (c) DELAY TIME FOR EVENT INITIATION 00 (48 49)

Fig. 6.12.

/20/74

FILE ID. NO.	ALPHA DESCRIPTION	TYPE	INT. SIZE	FILE DIMENSIONS			NO. OF CAIs	NO. OF HAIs	SMOOTHING FACTORS		MAX. STORE AHEAD	THE NAGATIVE BALANCE ACTIVITY CODE
				L	M	N			A1	A2		
0001	UNFLLD RDR	6	0001	129	01	01	010	020	100	100	0010	0000000
0002	WKLY DMNDR	3	0005	025	01	01	001	003	100	100	0005	0000000
0003	SMTH DMNDR	5	0005	021	01	01	002	001	100	100	0005	0000000
0004	INV LEVL R	6	0001	137	01	01	012	020	100	100	0012	0000000
0005	UNFLLD RDD	6	0001	153	01	01	016	020	100	100	0016	0000000
0006	WKLY DMNDD	3	0005	037	01	01	004	003	100	100	0020	0000000
0007	SMTH DMNDD	5	0005	021	01	01	002	001	100	100	0010	0000000
0008	INV LEVL D	6	0001	169	01	01	020	020	100	100	0020	0000000
0009	UNFLLD RDF	6	0001	169	01	01	020	020	100	100	0020	0000000
0010	WKLY DMNDF	3	0005	033	01	01	003	003	100	100	0015	0000000
0011	SMTH DMNDF	5	0005	021	01	01	002	001	100	100	0010	0000000
0012	INV LEVL F	6	0001	249	01	01	020	040	100	100	0020	0000000

1 5 15 16 20 23 25 27 30 33 36 39 43

Fig. 6.13.

The specifications of the 12 periodic data files are grouped in Figure 6.13. However, Figure 6.12 shows the specification of the retail weekly demand file. The number of HAIs for some level files was increased to 20.

The activity specification sheet is shown in Figure 6.14. All activities are periodic and have deterministic durations. The durations of activities 3,6 and 9 (the shipping activities) are determined by the activities. However, dummy values were entered based on the assumption that the actual and desired inventories are equal.

6. Coding the Activities

This section explains the FORTRAN implementation of the activities. The four activities associated with the retail sector are explained in detail. The other activities are similar. Finally, a listing of the USER subroutine is shown.

6.1 The Environmental Daily Demand Activity

The entire system is activated by the demand. Initially, the system will run for 300 STUs with a constant value of the daily demand. Then at time 300, the demand is increased by 10%. Effectively, the system's response due to a 10% increase in sales is studied. Running the system in a steady state for 300 STUs has the following advantages:

DATE 2/1/75

CARD A 1 1 1
77 80

CYSDEM

ACTIVITY PROCESSING SPECIFICATION FORM

GENERAL : EACH LINE (ONE CARD) SPECIFIES ONE ACTIVITY IN TERMS OF :

1) Its activity code (CD) and sub-code (SCD)

2) The method of triggering code (TC) and a corresponding parameter value (TPRM)

3) Activity processing time determination including : the average time (AT),
the distribution code (DC), the mean/variance code (MV),
the boundary value code (VL), the result code (RC),
a parameter number (PTP), and a modifier (TMD).

The values for the codes appear on the back of this form.

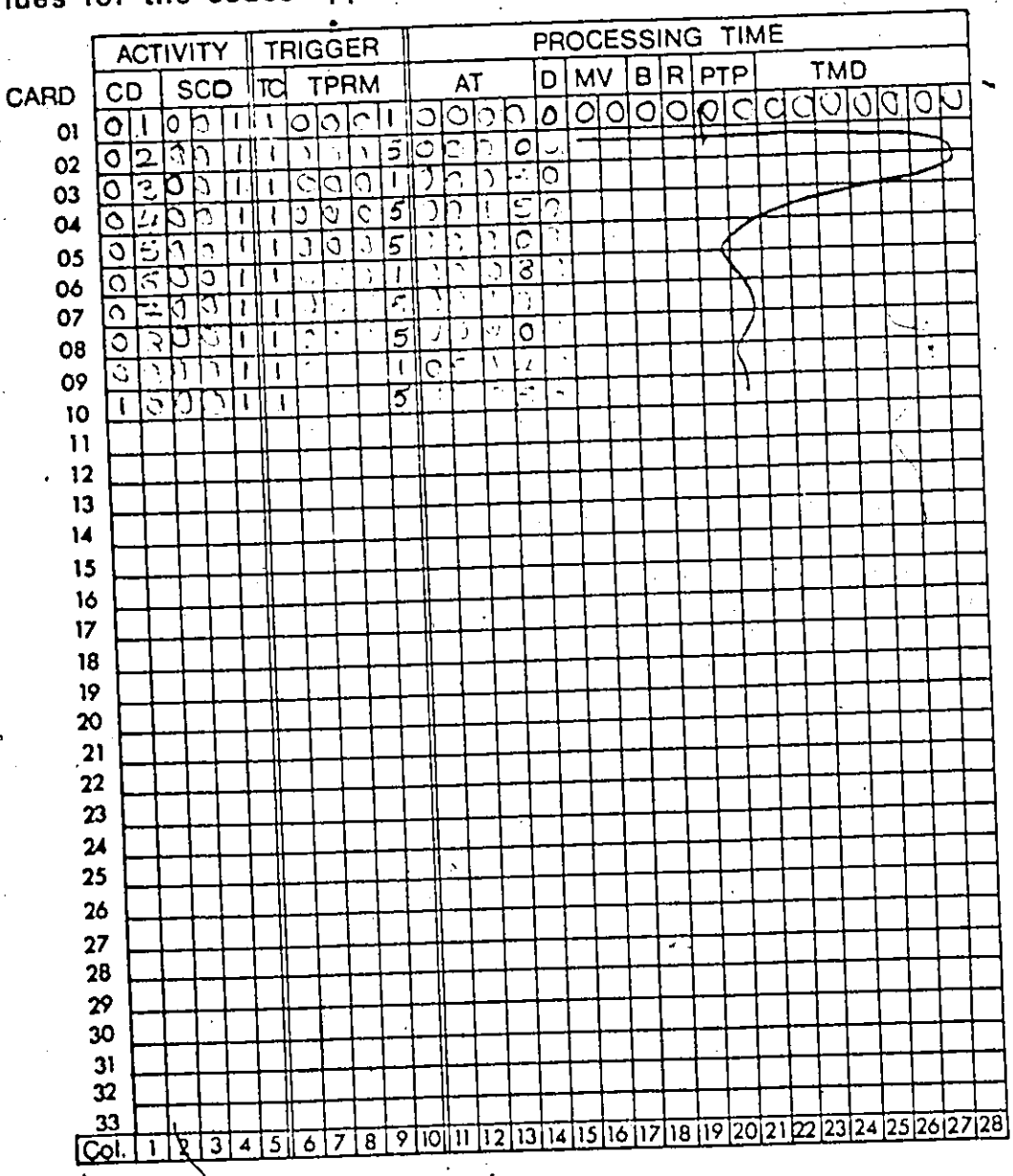


Fig. 6.14.

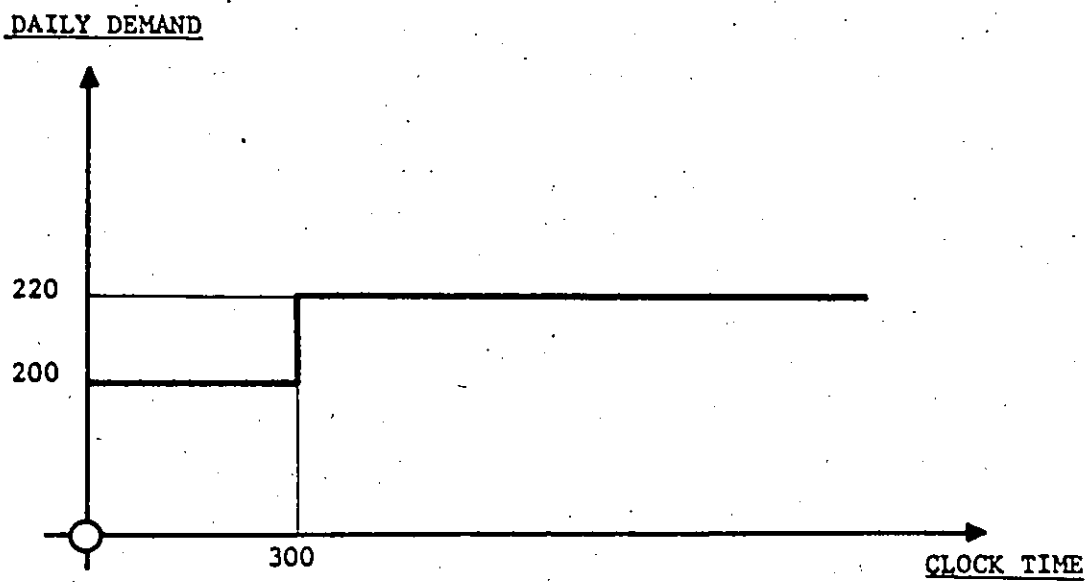


Fig. 6.15.

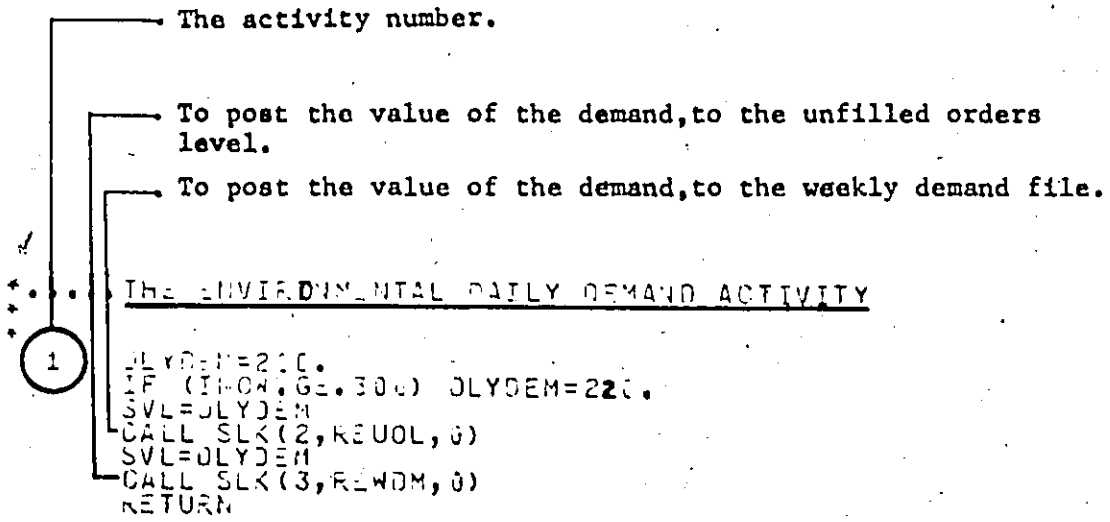


Fig. 6.16.

1) The transient effects due to the initialization process are removed.
2) Enables the user to verify that the model was constructed in a correct manner.

Figure 6.15 shows the relation between the daily demand and the time. The coding of the activity is shown in Figure 6.16.

6.2 The Retail Demand Smoothing Activity

The smoothed weekly demand is calculated using the exponential smoothing method where the older data is given less weight. The equation used is:

$$\text{New smoothed demand} = \text{old smoothed demand} + \frac{\text{the time interval}}{\text{smoothing time delay}} * (\text{the new weekly demand} - \text{old smoothed demand})$$

In our case, the time interval is one week (5 STUs) and the smoothing time delay is 8 weeks (40 STUs). The effect of this delay is shown in Figure 6.17 (called T in the figure).

6.3 The Retail Shipping Activity

The coding is shown in Figure 6.19. The comments explain the functions of the coding segments.

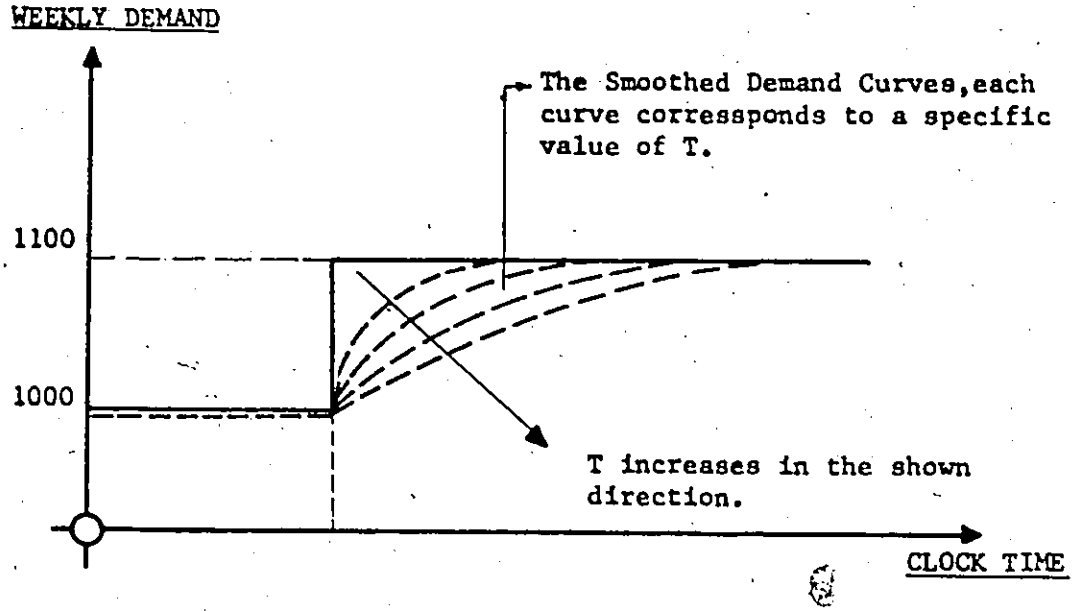


Fig. 6.17.

```
*.....TH  E THE WEEKLY DEMAND SMOOTHING ACTIVITY
*
*
*.....RETRIEVE THE VALUE JUST POSTED TO REWDM(THIS WEEKS DEMAND)
      ITR=1
      CALL RLX(4,REWDM,0)
      NEWDMR=RGVL1
*
*.....GET THE LAST VALUE OF THE SMOOTHED DAMAND
*
      ITR=0
      CALL RLX(42,RETSM,0)
      SDR=RGVL1
*
*.....CALCULATE THE NEW SMOOTHED DEMAND
*
      SDR=SDR+((NEWDMR-SDR)/8.)
*
*.....STORE THE NEW SMOOTHED DEMAND VALUE
*
      SVL=SDR
      CALL SLX(5,RETSM,0)
      RETURN
```

Fig. 6.18.

```
*.....THE RETAIL DAILY SHIPMENTS TO CUSTOMERS
*
*.....GET THE MOST RECENT AVAILABLE RECORD FROM THE SMOOTHED DEMAND.
*
(3)    ITR=0
       CALL RLK(8,RETSM,0)
       SMTHOR=RGVL1
*
*.....CALCULATE THE DESIRED INVENTORY.
*
       DESINV=6.*SMTHOR
*
*.....GET THE MOST RECENT AVAILABLE HAI OF THE ACTUAL INVENTORY,RETURN IF
*.....THERE IS NO INVENTORY
*
       ITR=0
       CALL RLK(7,REINV,0)
       ACTINV=RGVL1
       IF(ACTINV.EQ.0) RETURN
*
*.....CACULATE THE DELAY IN FILLING ORDERS IN DAYS AND ROUND IT. THIS IS
*.....THE DURATION OF THIS ACTIVITY
*
       DUR=5.+(2.*(DESINV/ACTINV))
       IDUR=DUR
       IF ((DUR-IDUR).GT.0.49) IDUR=IDUR+1
*
*.....UPDATE THE APPROPRIATE CYSDEM INTERNAL VARIABLES
*
       ILT=IDUR
       VL1=IDUR
       GVL1=IDUR
*.....GET THE MOST RECENT AVAILABLE HAI OF THE UNFILLED ORDERS
*
       ITR=0
       CALL RLK(6,REUOL,0)
       UNFLLD=RGVL1
*
*.....CALCULATE THE AMOUNT TO BE SHIPPED TO CUSTOMERS TO-DAY
*
       IAMT=UNFLLD/DUR
*
*.....CHECK IF IAMT IS MORE THAN THE AVAILABLE INVENTORY
*
       IF (IAMT.GT.ACTINV) IAMT=ACTINV
*
*.....UPDATE THE UNFILLED ORDERS AND THE INVENTORY
*
       SVL=-IAMT
       CALL SLK (9,REUOL,0)
       SVL=-IAMT
       CALL SLK(10,REINV,0)
       RETURN
```

Fig. 6.19.

6.4 The Retail Weekly Purchases from the Distributors

As previously explained, equation (6.5) is used to calculate the reorder amount. The following are the various coding segments that make this activity with an explanation, if required.

```
*.....THE WEEKLY RE-ORDERS FROM THE DISTRIBUTERS,ACTIVATED WEEKLY
*
*.....GET THIS WEEKS COMPLETE WEEKLY DEMAND
*
  4   ITR=-1
      CALL RLK(14,REWDM,0)
      RWKDEM=RGVL1
*
*.....GET THE DESIRED WEEKLY INVENTORY
*
      ITR=0
      CALL RLK(13,RETSM,0)
      SDR=RGVL1
      WDINVR=6.*SDR
*
```

Propotionality constant between the smoothed demand and the desired inventory.

The inventory file is a level file with an interval width of one STU. To get the actual weekly inventory, the first five available HAIs are retrieved and their average is the required value. The alternative to this approach is to introduce another periodic data file to carry the weekly inventory. Postings must be done to both the daily and the weekly inventory files.

```
*.....GET THE ACTUAL WEEKLY INVENTORY
*
      WKINVR=0
      ITR=0
      DO 15 I=1,5
      CALL RLK(12,REINV,0)
      WKINVR=WKINVR+RGVL1
  15  ITR=ITR+1
      ADINVR=WKINVR/5.
*
```

The normal level of unfilled orders is calculated using equation (6.6). The normal delay in filling the orders is the sum of the minimum order handling delay and the delay due to an out-of-stock item. This sum is equal to 1.4 weeks for the retail sector.

```
*.....CALCULATE THE NORMAL LEVEL OF WEEKLY UNFILLED ORDERS
*
      NWUCLR=SDR*1.4
*
```

Again, to get the weekly level of unfilled orders the average of the five available HAIs is taken.

```
*.....GET THE WEEKLY LEVEL OF UNFILLED ORDERS
*
      WKUOLR=0
      ITR=0
      DO 20 I=1,5
      CALL RLK(11,REUOL,0)
      WKUOLR=WKUOLR+RGVL1
20    ITR=ITR+1
      WKUOLR=WKUOLR/5.
*
```

The following is to calculate the desired pipeline contents:

```
*.....CALCULATE THE DESIRED WEEKLY PIPELINE CONTENTS BY MULTIPLYING THE
*.....SMOOTHED DEMAND BY THE SUM OF THE FOLLOWING DELAYS
*.....          DELAY IN CLERICAL PROCESSING OF ACTITIVITY 4 = 3 WEEKS
*.....          MAIL DELAY                                   = 0.5 WEEK
*.....          TRANSPORTATION DELAY                         = 1   WEEK
*.....          DELAY IN CLERICAL PROCESSING OF ACTIVITY 5.THIS SHOULD BE
*.....          THE LATEST DURATION.HOWEVER,PRACTICALLY IT IS DIFFICULT TO
*.....          OBTAIN THIS VALUE,THEREFORE AN AVERAGE VALUE WILL BE TAKEN,
*.....          BASED ON THE ASSUMPTION THAT THE ACTUAL AND DESIRED
*.....          INVENTORIES ARE EQUAL
*
      WKPIDR=SDR*(3.+0.5+1.+1.6)
*
```

The discussion in section 2.4 of this chapter pointed out that the values of the previous shipments and purchases of each sector should be stored. This is implemented by using the following pushdown stacks:

1) RWPO: This stack has four slots that carry the values of the last four Retail Weekly Purchase Orders. Each time the retail purchases activity is executed the amount ordered is inserted in the top of the stack.
2) DWPO: This stack has three slots that have the same function as RWPO for the distributor sector.
3) FWPO: This stack has seven slots that carry the last seven orders for production in the factory sector.
4) DDATR: This stack has 13 slots. Their function is to carry the last 13 amounts that were sent by the distributor to the retail sector.
5) FDATD: This stack has 20 slots. Their function is to carry the last 20 values of the amounts that were sent by the factory to the distributor sector.

The advantage of using these stacks is that they are available to any activity without delay. The alternative

was to use periodic data files to store the required amounts.

The following coding segment calculates the actual pipeline contents:

```
*.....GET THE ACTUAL PIPELINE CONTENTS,WHICH IS COMPOSED FROM
*.....          *ORDERS IN THE MAIL TO THE DISTRIBUTER
*.....          *ORDERS IN CLERICAL PROCESSING OF ACTIVITY 4
*.....          *UNFILLED ORDERS OF THE DISTRIBUTER
*.....          *GOODS IN TRANSIT TO THE RETAIL
*
*.....ORDERS IN THE MAIL
*
      AMAILR=RWPO(4)*(1./2.)
*
*.....ORDERS IN CLERICAL PROCESSING
*
      CLRKLR=RWPO(1)+RWPO(2)+RWPO(3)
*
```

The weekly unfilled orders backlog at the distributor is the average of the first five available HAIs in the daily distributor unfilled orders level file.

```
*.....UNFILLED ORDERS AT THE DISTRIBUTER
*
      WDUOL=0.
      ITR=0
      DO 30 I=1,5
      CALL RLK(15,DIUOL,0)
      WDUOL=WDUOL+RGVL1
   30 ITR=ITR+1
      WDUOL=WDUOL/5.
*
*
*.....GOODS IN TRANSIT TO THE RETAIL
*
      GITDR=DDATR(9)+DDATR(10)+DDATR(11)+DDATR(12)+DDATR(13)
*
*.....THE ACTUAL PIPELINE CONTENTS ARE
*
      ACTRNR=AMAILR+CLRKLR+WDUOL+GITDR
```

Using equation (6.5) calculate the amount to be reordered and round it. The rest of the coding is explained by the comments.

```
*.....THE AMOUNT TO BE RE-ORDERED IS
*
      REORR=RWKDEM+(0.25*((WDINVR-ADINVR)+(WKUCLR-NWUOLR)+(WKPIOR-ACTRNR
     1)))
      IREORR=REORR
*
*.....UPDATE THE RWPO STACK , PERFORM PUSHDOWN
*
      DO 40 I=2,4
   40 RWPO(6-I)=RWPO(5-I)
      RWPO(1)=IREORR
*
*.....UPDATE THE DISTRIBUTER DEMAND AND UNFILLED ORDERS
*
      SVL=IREORR
      CALL SLK(17,DIUOL,0)
      SVL=IREORR
      CALL SLK(16,DIWDM,0)
      RETURN
*
```

This terminates the retail sector. The coding of the distributor and the factory sectors are similar to that of the retail. The difference is in the values of the parameters. The coding of all the activities is in the subroutine USER. This subroutine is shown in Figure 6.20.

7. System Initialization

The initial conditions that were assumed by Forrester are used here to initialize the data files and the five stacks. The first thing to do is to get the earliest possible starting time. This value is used to

```
      SUBROUTINE USER
      COMMON/GMP/INOW,IEND,IAC,IASC,IBEG,ILT
      COMMON/ERR/E1,E2,E3,E4
      COMMON/TVL/ITA,TVL(3),TGVL(3),IP(3),ITRC
      COMMON/SVAL/SGVL,SVL,ISX,JSX,ICI,ISRC
      COMMON/RVAL/RGVL1,RGVL2,IRT,IAT,RVL1,RVL2,NRE,IRC
      COMMON/RINF/ITR,IRX,JRX
      COMMON/NSL/TNBL(50),GNBL(50)
      COMMON RCUCL(129),REWOM(25),RETSM(21),REINV(137),DIUCL(153),
     1DIWOM(37),DIRSM(21),DIINV(169),FAUCL(169),FAWOM(33),FACSM(21),
     2FAINV(249)
*
*.....THE FOLLOWING COMMON BLOCK IS NEEDED IF AN ACTIVITY DETERMINES ITS
*.....OWN DURATION
*
      COMMON/CVLS/GVL1,VL1,IDC,LN
*.....THE FOLLOWING STACKS ARE REQUIRED BY ACTIVITIES 4,7,10 TO STORE
*.....THE WEEKLY RE-ORDERED AMOUNTS
      DIMENSION RWPO(4),DWPO(3),FWPO(7)
*
*.....THE FOLLOWING STACKS CONTAIN THE DAILY SHIPMENTS FROM THE
*.....DISTRIBUTER AND THE FACTORY SECTORS.
*
      DIMENSION DDATR(13),FDATD(23)
*.....INITIALIZE THE WEEKLY RE-ORDERS TO BE EQUAL TO THE RETAIL DEMAND
      DATA RWPO/4*1000./,DWPO/3*1000./,FWPO/7*1000./
*.....INITIALIZE THE DAILY SHPMENTS TO BE EQUAL TO ONE FIFTH OF THE
*.....CUSTOMER DEMAND
      DATA DDATR,FDATD/33*200./
*
      GO TO (1,2,3,4,5,6,7,8,9,10) IAC
*
*
*.....THE ENVIRONMENTAL DAILY DEMAND ACTIVITY
*
*
    1 DLYDEM=200.
      IF (INOW.GE.300) DLYDEM=220.
      SVL=DLYDEM
      CALL SLK(2,REUCL,0)
      SVL=DLYDEM
      CALL SLK(3,REWOM,0)
      RETURN
*
*
*****************************    THE RETAIL SECTOR    ********************
*
*
*.....THE RETAIL WEEKLY DEMAND SMOOTHING ACTIVITY
*
*
*.....RETREIVE THE VALUE JUST POSTED TO REWOM(THIS WEEKS DEMAND)
    2 ITR=-1
      CALL FLK(4,REWOM,0)
      REWOMR=RGVL1
*
*.....GET THE LATEST VALUE OF THE SMOOTHED DEMAND
```

Fig. 6.20.

```
*
      ITR=0
      CALL RLK(48,RETSM,0)
      SDR=RGVL1
*
*.....CALCULATE THE NEW SMOOTHED DEMAND
*
      SDR=SDR+((NEWDMR-SDR)/8.)
*
*.....STORE THE NEW SMOOTHED DEMAND VALUE
*
      SVL=SDR
      CALL SLK(5,RETSM,0)
      RETURN
*
*
*
*
*
*
*.....THE RETAIL DAILY SHIPMENTS TO CUSTOMERS
*
*.....GET THE MOST RECENT AVAILABLE RECORD FROM THE SMOOTHED DEMAND.
*
    3 ITR=0
      CALL RLK(8,RETSM,0)
      SMTHDR=RGVL1
*
*.....CALCULATE THE DESIRED INVENTORY.
*
      DESINV=8.*SMTHDR
*
*.....GET THE MOST RECENT AVAILABLE HAI OF THE ACTUAL INVENTORY,RETURN IF
*.....THERE IS NO INVENTORY
*
      ITR=0
      CALL RLK(7,REINV,0)
      ACTINV=RGVL1
      IF(ACTINV.EQ.0) RETURN
*
*.....CACULATE THE DELAY IN FILLING ORDERS IN DAYS AND ROUND IT. THIS IS
*.....THE DURATION OF THIS ACTIVITY
*
      DUR=5.+(2.*(DESINV/ACTINV))
      IDUR=DUR
      IF ((DUR-IDUR).GT.0.49) IDUR=IDUR+1
*
*.....UPDATE THE APPROPRIATE CYSDEM INTERNAL VARIABLES
*
      ILT=IDUR
      VL1=IDUR
      GVL1=IDUR
*.....GET THE MOST RECENT AVAILABLE HAI OF THE UNFILLED ORDERS
*
      ITR=0
      CALL RLK(6,REUOL,0)
      UNFLLD=RGVL1
```

Fig. 6.20(cont.).

```
*
*.....CALCULATE THE AMOUNT TO BE SHIPPED TO CUSTOMERS TO-DAY
*
      IAMT=UNFLLD/DUR
*
*.....CHECK IF IAMT IS MORE THAN THE AVAILABLE INVENTORY
*
      IF (IAMT.GT.ACTINV) IAMT=ACTINV
*
*.....UPDATE THE UNFILLED ORDERS AND THE INVENTORY
*
      SVL=-IAMT
      CALL SLK (9,REUOL,0)
      SVL=-IAMT
      CALL SLK(10,REINV,0)
      RETURN
*
*
*
*
*
*.....THE WEEKLY RE-ORDERS FROM THE DISTRIBUTERS,ACTIVATED WEEKLY
*
*.....GET THIS WEEKS COMPLETE WEEKLY DEMAND
*
    4 ITR=-1
      CALL RLK(14,REWDM,0)
      RWKDEM=RGVL1
*
*.....GET THE DESIRED WEEKLY INVENTORY
*
      ITR=0
      CALL RLK(13,RETSM,0)
      SDR=RGVL1
      WDINVR=8.*SDR
*
*.....GET THE ACTUAL WEEKLY INVENTORY
*
      WKINVR=0
      ITR=0
      DO 15 I=1,5
      CALL RLK(12,REINV,0)
      WKINVR=WKINVR+RGVL1
   15 ITR=ITR+1
      ADINVR=WKINVR/5.
*
*.....CALCULATE THE NORMAL LEVEL OF WEEKLY UNFILLED ORDERS
*
      NWUCLR=SDR*1.4
*
*.....GET THE WEEKLY LEVEL OF UNFILLED ORDERS
*
      WKUOLR=0
      ITR=0
      DO 20 I=1,5
      CALL RLK(11,REUOL,0)
```

Fig. 6.20(cont.)

```
      WKUCLR=WKUOLR+RGVL1
   20 ITR=ITR+1
      WKUCLR=WKLOLR/5.
*
*.....CALCULATE THE DESIRED WEEKLY PIPELINE CONTENTS BY MULTIPLYING THE
*.....SMOOTHED DEMAND BY THE SUM OF THE FOLLOWING DELAYS
*.....          DELAY IN CLERICAL PROCESSING OF ACTITIVITY 4 = 3 WEEKS
*.....          MAIL DELAY                                   = 0.5 WEEK
*.....          TRANSPORTATION DELAY                         = 1   WEEK
*.....          DELAY IN CLERICAL PROCESSING OF ACTIVITY 5.THIS SHOULD BE
*.....          THE LATEST DURATION.HOWEVER,PRACTICALLY IT IS DIFFICULT TO
*.....          OBTAIN THIS VALUE,THEREFORE AN AVERAGE VALUE WILL BE TAKEN,
*.....          BASED ON THE ASSUMPTION THAT THE ACTUAL AND DESIRED
*.....          INVENTORIES ARE EQUAL
*
      WKPIDR=SDR*(3.+0.5+1.+1.5)
*
*.....GET THE ACTUAL PIPELINE CONTENTS,WHICH IS COMPOSED FROM
*.....          ORDERS IN THE MAIL TO THE DISTRIBUTER
*.....          ORDERS IN CLERICAL PROCESSING OF ACTIVITY 4
*.....          UNFILLED ORDERS OF THE DISTRIBUTER
*.....          GOODS IN TRANSIT TO THE RETAIL
*
*.....ORDERS IN THE MAIL
*
      AMAILR=RWPO(4)*(1./2.)
*
*.....ORDERS IN CLERICAL PROCESSING
*
      CLRKLR=RWPO(1)+RWPO(2)+RWPO(3)
*
*.....UNFILLED ORDERS AT THE DISTRIBUTER
*
      WDUCL=0
      ITR=0
      DO 30 I=1,5
      CALL FLK(15,OIUOL,0)
      WDUCL=WDUCL+RGVL1
   30 ITR=ITR+1
      WDUOL=WDUCL/5.
*
*.....GOODS IN TRANSIT TO THE RETAIL
*
      GITDR=DDATR(9)+DDATR(10)+DDATR(11)+DDATR(12)+DDATR(13)
*
*.....THE ACTUAL GOODS IN TRANSIT IS
*
      ACTRNR=AMAILR+CLRKLR+WDUOL+GITDR
*
*.....THE AMOUNT TO BE RE-ORDERED IS
*
      REORR=RWKDEM+(0.25*((WDINVR-ADINVR)+(WKUCLR-WKUOLR)+(WKPIDR-ACTRNR
     1)))
      IREORR=REORR
*
*.....UPDATE THE RWPO STACK , PERFORM PUSHDOWN
*
```

```
      DO 40 I=2,4
   40 RWPO(6-I)=RWPO(5-I)
      RWPO(1)=IREORR
C
C.....UPDATE THE DISTRIBUTER DEMAND AND UNFILLED ORDERS
C
      SVL=IREORR
      CALL SLK(17,DIUOL,0)
      SVL=IREORR
      CALL SLK(18,DIWDM,0)
      RETURN
C
C
C
```

```
      SVL=-IAMT
      CALL SCK(24,DIUOL,0)
      SVL=-IAMT
      CALL SCK(26,DIINV,0)
      SVL=IAMT
      CALL SCK(25,REINV,0)
*
*.....UPDATE THE STACK DDATR
*
      DO 50 I=2,13
 50   DDATR(15-I)=DDATR(14-I)
      DDATR(1)=IAMT
      RETURN
*
*
*
*
*.....THE DISTRIBUTER WEEKLY RE-ORDERS FROM THE FACTORY
*
  7   ITR=-1
      CALL RLK(30,DIWDM,0)
      DWKDEM=RGVL1
      ITR=0
      CALL RLK(29,DISSM,0)
      SDD=RGVL1
      WDINVD=6.*SDD
      WKINVD=0.
      ITR=0
      DO 60 I=1,5
      CALL RLK(28,DIINV,0)
      WKINVD=WKINVD+RGVL1
 60   ITR=ITR+1
      ADINVD=WKINVD/5.
      NWUCLD=SDD*1.6
      WKUOLD=0
      ITR=0
      DO 70 I=1,5
      CALL RLK(27,DIUOL,0)
      WKUOLD=WKUOLD+RGVL1
 70   ITR=ITR+1
      WKUCLD=WKUOLD/5.
      WKPICD=SDD*(2.+0.5+2.+1.8)
      AMAILD=DWPO(3)*(1./2.)
      CLRKLD=DWPO(1)+DWPO(2)
      WDUOL=0
      ITR=0
      DO 80 I=1,5
      CALL RLK(31,FAUOL,0)
      WDUOL=WDUOL+RGVL1
 80   ITR=ITR+1
      WDUOL=WDUOL/5.
      GITFD=0.
      DO 33 I=11,25
 33   GITFD=GITFD+FDATD(I)
      ACTRND=AMAILD+CLRKLD+WDUOL+GITFD
      REORD=DWKDEM+(0.25*((WDINVD-ADINVD)+(WKUCLD-NWUOLD)+(WKPICD-ACTRND
     1)))
```

```
      IRECRD=RECRD
      OWPO(3)=OWPO(2)
      OWPO(2)=OWPO(1)
      OWPO(1)=IRECRD
      SVL=IRECRD
      CALL SLK(33,FAUOL,0)
      SVL=IRECRD
      CALL SLK(34,FAWDM,0)
      RETURN
*
*
*
********** THE FACTORY SECTOR **********
*
*.....THE FACTORY DEMAND SMOOTHING ACTIVITY
*
    8 ITR=-1
      CALL RLK(35,FAWDM,0)
      NEWDMF=RGVL1
      ITR=0
      CALL RLK(50,FACSM,0)
      SDF=RGVL1
      SDF=SDF+((NEWDMF-SDF)/8.)
      SVL=SDF
      CALL SLK(36,FACSM,0)
      RETURN
*
*
*
*
*.....THE FACTORY DAILY SHIPPMENTS TO THE DISTRIBUTER
*
    9 ITR=0
      CALL RLK(39,FACSM,0)
      SMTHDF=RGVL1
      DESINV=4.*SMTHDF
      ITR=0
      CALL RLK(38,FAINV,0)
      ACTINV=RGVL1
      IF (ACTINV.EQ.0.) RETURN
      DUR=3.+(5.*(DESINV/ACTINV))
      IDUR=DUR
      IF ((DUR-IDUR).GT.0.49) IDUR=IDUR+1
      GVL1=IDUR
      ILT=IDUR
      VL1=IDUR
      ITR=0
      CALL RLK(37,FAUOL,0)
      UNFLLF=RGVL1
      IAMT=UNFLLF/DUR
      IF (IAMT.GT.ACTINV)  IAMT=ACTINV
      SVL=-IAMT
      CALL SLK(40,FAUOL,0)
      SVL=IAMT
      CALL SLK(41,DIINV,0)
      SVL=-IAMT
      CALL SLK(42,FAINV,0)
```

```
      DO 100 I=2,20
  100 FDATO(22-I)=FDATO(21-I)
      FDATO(1)=IAMT
      RETURN
*
*
*
*
*.....THE AMOUNT TO BE MANUFACTURED NEXT WEEK
*
   10 ITR=-1
      CALL RLK(45,FAWDM,0)
      FWKDEM=RGVL1
      ITR=0
      CALL RLK(45,FACSM,0)
      SOF=RGVL1
      WDINVF=4.*SOF
      WKINVF=0.
      ITR=0
      DO 110 I=1,5
      CALL RLK(44,FAINV,0)
      WKINVF=WKINVF+RGVL1
  110 ITR=ITR+1
      ADINVF=WKINVF/5.
      NWUOLF=SOF*1.8
      WKUOLF=0
      ITR=0
      DO 120 I=1,5
      CALL RLK(43,FAUOL,0)
      WKUOLF=WKUOLF+RGVL1
  120 ITR=ITR+1
      WKUOLF=WKUOLF/5.
      WKPIDF=SOF*(1.+6.)
*
*.....ACTUAL PIPELINE CONTENTS CONSIST OF  ORDERS IN CLERICAL PROCESSING
*.....AND OTHERS BEING MANUFACTURED
*
      ACTRNF=0.
      DO 130 I=1,7
  130 ACTRNF=ACTRNF+FWPO(I)
      AMNFCT=FWKDEM+(0.25*((WDINVF-ADINVF)+(WKUOLF-NWUOLF)+(WKPIDF-ACTRN
     1F)))
      MANFCT=AMNFCT
*
*.....CHECK WITH THE FACTORY CAPACITY.
*
      IF(MANFCT.GT.10000) MANFCT=10000.
      DO 140 I=2,7
  140 FWPO(8-I)=FWPO(6-I)
      FWPO(1)=MANFCT
      SVL=MANFCT
      CALL SLK(47,FAINV,0)
      RETURN
      END
```

Fig. 6.20(cont.)

align the data files.

IBEG = Max. [Int. width * (1 + No. of HAIs)]

Since that the factory inventory level has 40 HAIs. Therefore, IBEG = 41.

The simulation will start with all periodic data files aligned to the first day of a week. Therefore, the initial upper bound of all the first HAIs is (IBEG-1=40).

The following are some general notes on periodic data file initialization:

1) When none of the file's storage links have lags, then the access time of the first HAI should be (IBEG-1).
2) If lags exist then a possible approach to calculate the access times is to make the access time of the first HAI equal to:
   (IBEG-1) + Max. (storage link lag)
3) Once the access time of the first HAI is obtained then the access time of the other initial intervals is easily obtained because the difference between the access times of two sequential intervals is equal to the interval width.
4) In level files, the true/recorded values in the CAIs are set equal to those of the first HAI.

5) For files of type 5, the true/recorded values are set to zero.

The above rules are general and are not always true. The alternative was to perform a hand simulation in order to get better values. Obviously that is a tedious task. The output time plots (of Chapter 7) shows that the system ran for about 100 STUs before reaching the steady state.

The following explains how the initial true/recorded values were obtained:

1) The retail unfilled orders = the normal unfilled orders.
2) The retail weekly demand = 1000
3) The retail smoothed demand = 1000
4) The retail inventory = the desired inventory.

Similarly, the other two sectors. The twelve initialization sheets are shown in Figure 6.21

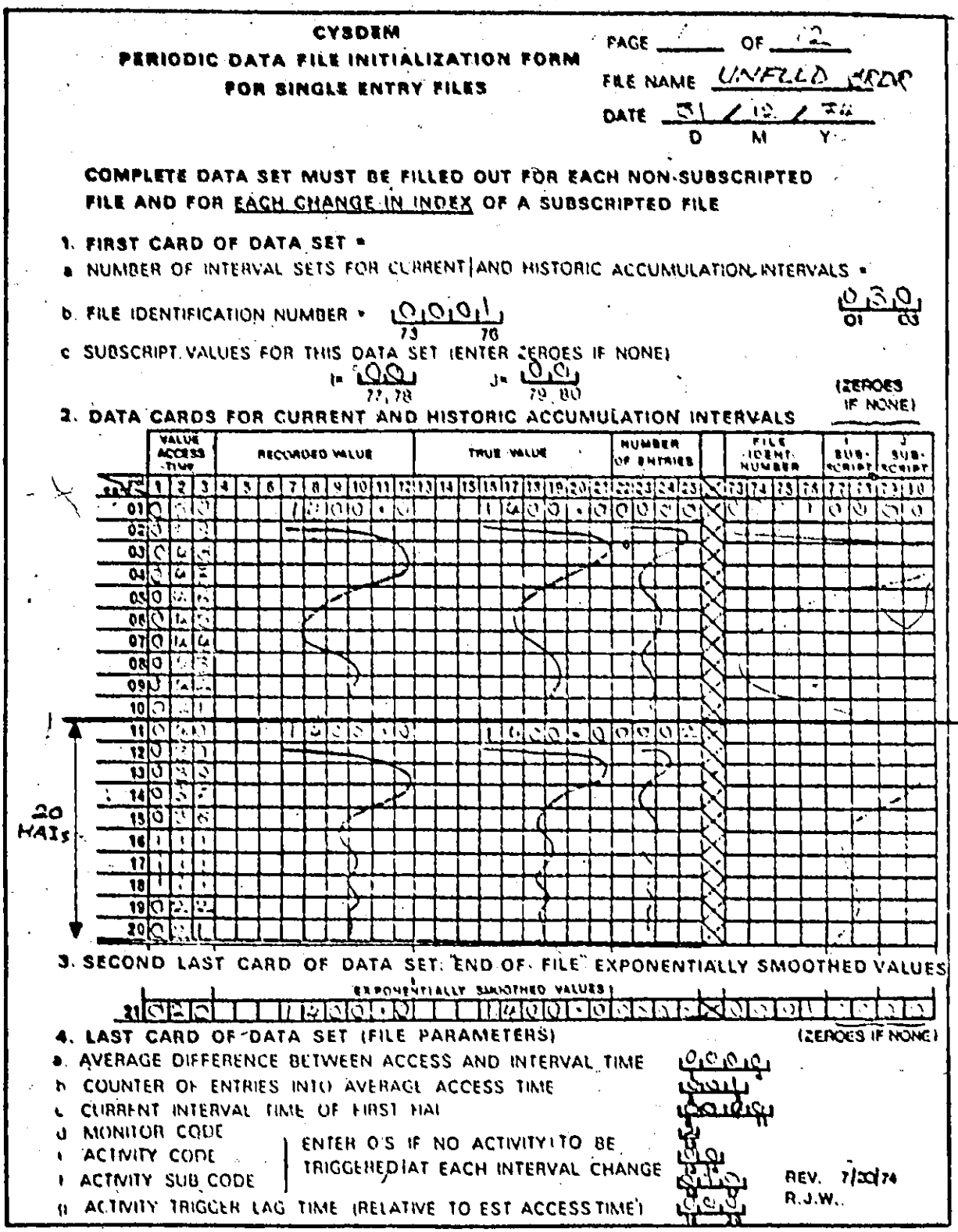
The simulator initialization data is shown in Figure 6.22 and the events list initialization is shown in Figure 6.23.

8. The Three Main Programs

- CYSRPT is shown in Figure 6.24.
- CYSIM is shown in Figure 6.25. The associated subroutine USER was shown in Figure 6.20.

- The sorting parameters for the CDC 6400 are shown in Figure 6.26. The sorting was done using the interval time as the minor key.

- The parameters for CYSTAT are shown in Figure 6.27.



CYSDEM
PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE ____ OF 2
FILE NAME UNFLLD ERDR
DATE 31 / 12 / 74
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =
a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 030 (01, 03)
b. FILE IDENTIFICATION NUMBER = 00001 (73, 76)
c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)
I = 00 (77, 78) J = 00 (79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

	VALUE ACCESS TIME	RECORDED VALUE	TRUE VALUE	NUMBER OF ENTRIES	FILE IDENT. NUMBER	I SUBSCRIPT	J SUBSCRIPT
	1 2 3	4 5 6 7 8 9 10 11 12	13 14 15 16 17 18 19 20 21	22 23 24 25	73 74 75 76	77 78	79 80
01		1 0 0 . 0	1 0 0 . 0	0 0 0 0	0 0 0 1	0 0	0 0
02							
03							
04							
05							
06							
07							
08							
09							
10							
11		1 0 0 . 0	1 0 0 . 0	0 0 0 0			
12							
13							
14							
15							
16							
17							
18							
19							
20							

20 HAIs

3. SECOND LAST CARD OF DATA SET: "END OF FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES																								
21	0 2 0			1 0 0 0 0						1 0 0 0 . 0				0 0 0 0				0 0				0 0		

4. LAST CARD OF DATA SET (FILE PARAMETERS) (ZEROES IF NONE)
a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME
b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME
c. CURRENT INTERVAL TIME OF FIRST HAI
d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
(ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)
g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/30/74
R.J.W.

Fig. 6.21

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 2 OF 12

FILE NAME WKLY DMNDR

DATE 31 / 12 / 1974
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 004 (01, 03)

b. FILE IDENTIFICATION NUMBER = 01012 (73, 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (77, 78) J = 00 (79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TYPE (1-3)	RECORDED VALUE (4-12)	TRUE VALUE (13-21)	NUMBER OF ENTRIES (22-25)	FILE IDENT. NUMBER (73-76)	I SUBSCRIPT (77-78)	J SUBSCRIPT (79-80)
01	045	0.0	0.0	0	0101	2	
02	045	1.	1.				
03	045	1.0	1.0	1			
04	045	1.	1.				
05							
06							
07				5			
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

CARD	EXPONENTIALLY SMOOTHED VALUES (1-12)
21	025 0.0 0.

4. LAST CARD OF DATA SET (FILE PARAMETERS) (ZEROES IF NONE)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0.0
b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0
c. CURRENT INTERVAL TIME OF FIRST HAI 0.0
d. MONITOR CODE 0
e. ACTIVITY CODE 0
f. ACTIVITY SUB CODE 0
g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME) 0.0

(ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)

REV. 7/20/74
R.J.W.

Fig. 6.21(cont.)

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM

FOR SINGLE ENTRY FILES

PAGE 3 OF 12

FILE NAME SMITH DMNDR

DATE 31 / 12 / 1974 (D / M / Y)

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 003 (cols 01–03)

b. FILE IDENTIFICATION NUMBER = 0003 (cols 73–76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (cols 77, 78) J = 00 (cols 79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TIME (1–3)	RECORDED VALUE (4–12)	TRUE VALUE (13–20)	NUMBER OF ENTRIES (21–25)	FILE IDENT. NUMBER (73–76)	I SUBSCRIPT (77–78)	J SUBSCRIPT (79–80)
01	050	0	0	0	0003	00	00
02	000	0	0	0	0000	00	00
03	040	1	1	1	0000	00	00
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

CARD	EXPONENTIALLY SMOOTHED VALUES (1–12)
21	0 0 0

4. LAST CARD OF DATA SET (FILE PARAMETERS) (ZEROES IF NONE)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0000

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0001

c. CURRENT INTERVAL TIME OF FIRST HAI 000000

d. MONITOR CODE 0

e. ACTIVITY CODE 00

f. ACTIVITY SUB CODE 0000

ENTER 0'S IF NO ACTIVITY IS TO BE TRIGGERED AT EACH INTERVAL CHANGE

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME) 0000

REV. 7/20/74 R.J.W.

Fig. 6.21(cont.)

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM

FOR SINGLE ENTRY FILES

PAGE 4 OF 12

FILE NAME INV LEVL R

DATE 31 / 12 / 1974 (D M Y)

COMPLETE DATA-SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 032 (01, 03)

b. FILE IDENTIFICATION NUMBER = 0004 (73, 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (77, 78) J = 00 (79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

SET	VALUE ACCESS TIME (1-3)	RECORDED VALUE (4-12)	TRUE VALUE (13-21)	NUMBER OF ENTRIES (22-25)	FILE IDENT. NUMBER (73-76)	I SUB-SCRIPT (77-78)	J SUB-SCRIPT (79-80)
01	011	00.0	00.0	0000	0004	00	00
02	012						
03	013						
04	014						
05	015						
06	052						
07	053						
08	054						
09	055						
10	056						
11	057						
12	058						
13	059			0000			
14	060						
15	061						
16	062						
17	063						
18	064						
19							
20	026						

20 HAIs

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES (1-12)				(ZEROES IF NONE)
21	025	8.0	3.0	0000	0000

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0005 (1-4)

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0000 (5-8)

c. CURRENT INTERVAL TIME OF FIRST HAI 000000 (9-14)

d. MONITOR CODE 0 (15)

e. ACTIVITY CODE 00 (16-17)

f. ACTIVITY SUB CODE 00 (18-19)

ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME) 0000 (20-23)

REV. 7/20/74 R.J.W.

Fig. 6.21(cont.)

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM

FOR SINGLE ENTRY FILES

PAGE 5 OF 12

FILE NAME UNFLLD ARDD

DATE 31 / 12 / 1974 (D / M / Y)

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 036 (01–03)

b. FILE IDENTIFICATION NUMBER = 0005 (73–76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (77,78) J = 00 (79,80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

	VALUE ACCESS TIME			RECORDED VALUE										TRUE VALUE										NUMBER OF ENTRIES				FILE IDENT. NUMBER				I SUB-SCRIPT		J SUB-SCRIPT	
SEQ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	73	74	75	76	77	78	79	80
01	0	5	0				1	5	0	0	.	0				1	5	0	0	.	0	0	0	0	0				5	0	0	0	0	0	0
02	0	5	2																																
03		1																																	
04		1																																	
05		1																																	
06		1																																	
07		1																																	
08	0	4	6																																
09	0	4	5																																
10		4	4																																
11	0	4	3																			0													
12	3	4	2																																
13	3	4	1																																
14	0	4	0																																
15	0	3	9																																
16	0	3	8																																
17	0	3	7																																
18	0	3	6																																
19	0	3	5																																
20	0	3	4																																

16 CAIs

20 HAIs

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES																																		
21	0	2	2				1	5	0	0	.	0				1	5	0	0	.	0	0	0	0	2										

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0003 (1–4)

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 01 (5–6)

c. CURRENT INTERVAL TIME OF FIRST HAI 0140 (7–10)

d. MONITOR CODE (11)

e. ACTIVITY CODE (12)

f. ACTIVITY SUB CODE (13–14)

ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME) 000 (15–17)

REV. 7/20/74 R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 6 OF 12

FILE NAME WKLY DMNPD

DATE 1 / 1 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 007 (01, 03)

b. FILE IDENTIFICATION NUMBER = 0006 (73, 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I= 00 (77, 78) J= 03 (79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TIME (1-3)	RECORDED VALUE (4-12)	TRUE VALUE (13-21)	NUMBER OF ENTRIES (22-25)	FILE IDENT. NUMBER (73-76)	I SUB-SCRIPT (77-78)	J SUB-SCRIPT (79-80)
01	0 6	11.000	1.000		0006	00	03
02	0 1						
03	0 5						
04	0 1						
05	0 4	1.000	1.000				
06	0 2						
07	0 3						
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

CARD	EXPONENTIALLY SMOOTHED VALUES (1-21)
21	0 0 0

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0003

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME

c. CURRENT INTERVAL TIME OF FIRST HAI

d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
(ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/20/74
R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 7 OF 12

FILE NAME SMTH DMND

DATE 01 / 01 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =
   a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 002 (01, 03)
   b. FILE IDENTIFICATION NUMBER = 0007 (73, 76)
   c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE) I= 00 (77, 78) J= 00 (79, 80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

SET	VALUE ACCESS TIME (1–3)	RECORDED VALUE (4–11)	TRUE VALUE (12–21)	NUMBER OF ENTRIES (22–25)	FILE IDENT. NUMBER (73–76)	I SUB-SCRIPT (77–78)	J SUB-SCRIPT (79–80)
01	05				0007	00	
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES (1–10)	(ZEROES IF NONE)
21	000	

4. LAST CARD OF DATA SET (FILE PARAMETERS)
   a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME
   b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME
   c. CURRENT INTERVAL TIME OF FIRST HAI
   d. MONITOR CODE
   e. ACTIVITY CODE
   f. ACTIVITY SUB CODE
   (ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)
   g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST. ACCESS TIME)

REV. 7/20/74
R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM

FOR SINGLE ENTRY FILES

PAGE 8 OF 12

FILE NAME INV LEVL D

DATE 01 / 01 / 1975 (D M Y)

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 01 03

b. FILE IDENTIFICATION NUMBER = 0108 (73 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (77,78) J = 00 (79,80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TIME (1-3)	RECORDED VALUE (7-12)	TRUE VALUE (16-21)	NUMBER OF ENTRIES (22-25)	FILE IDENT. NUMBER (73-76)	I SUBSCRIPT (77,78)	J SUBSCRIPT (79,80)
01	070	000.0	000.0	0000	0108	00	00
02	060						
03	050						
04	040						
05							
06							
07	010						
08	030						
09	020						
10	010						
11	050			0002			
12	040						
13	030						
14	020						
15	010						
16							
17							
18							
19							
20	031						

20 CAIs

20 HAIs

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

CARD	EXPONENTIALLY SMOOTHED VALUES (1-3, 7-12, 16-21)
21	000.0

4. LAST CARD OF DATA SET (FILE PARAMETERS) (ZEROES IF NONE)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0010 (1-4)

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0000 (5-8)

c. CURRENT INTERVAL TIME OF FIRST HAI 000000 (9-14)

d. MONITOR CODE 0 (15)

e. ACTIVITY CODE 0 (16)

f. ACTIVITY SUB CODE 00 (17,18)

ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME) 000 (19-21)

REV. 7/20/74
R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 9 OF 12

FILE NAME UNFLLD ORDF

DATE 01 / 01 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT | AND HISTORIC ACCUMULATION INTERVALS = 0 4 0 (01 03)

b. FILE IDENTIFICATION NUMBER = 9 8 6 5 (73 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)
I= 0 0 (77,78) J= 0 0 (79,80) (ZEROES IF NONE)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS

CARD	VALUE ACCESS TIME (1 2 3)	RECORDED VALUE (7 8 9 10 11 12)	TRUE VALUE (16 17 18 19 20 21)	NUMBER OF ENTRIES (22 23 24 25)	FILE IDENT. NUMBER (73 74 75 76)	I SUB-SCRIPT (77 78)	J SUB-SCRIPT (79 80)
01	0 5	2 0 0 0 . 0	2 2 2 0 . 0	0 0 0 0	9 8 6 5	0 0	
02	0 5 2						
03	1 1 1						
04	1 1 1						
05	1 1 1						
06	1 1 1						
07	1 1 1						
08	0 4 6						
09	0 4 5						
10							
11	0 4 2			0 0 0 0			
12	0 4 2						
13	0 4 1						
14	0 4 0						
15	1 1 1						
16	1 1 1						
17	1 1 1						
18	1 1 1						
19	0 2 5						
20	0 2 4						

20 CARDS

20 HAIS

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES (1 2 3 4 5 6 7 8 9 10 11 12)
21	0 0 0 . 0 2 2 0 . 0

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS).

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0 0 0 3
b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 1 0 0 0
c. CURRENT INTERVAL TIME OF FIRST HAI 0 0 0 0 0 1
d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE
g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/20/74
R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 10 OF 12

FILE NAME WKLY DMNDF

DATE 01 / 01 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 006 (01 03)

b. FILE IDENTIFICATION NUMBER = 0010 (73 76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)
I= 00 (77,78) J= 00 (79,80) (ZEROES IF NONE)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS

SET	VALUE ACCESS TIME (1-3)	RECORDED VALUE (4-12)	TRUE VALUE (13-21)	NUMBER OF ENTRIES (22-25)	FILE IDENT. NUMBER (73-76)	I SUB-SCRIPT (77,78)	J SUB-SCRIPT (79,80)
01	0	1.0	1.0		0010	00	00
02	0						
03	0						
04	0						
05	0						
06	0						
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES (1-9)
21	0.0

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0003
b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME
c. CURRENT INTERVAL TIME OF FIRST HAI
d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
(ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)
g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/20/74
R.J.W.

CYSDEM
PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 11 OF 12
FILE NAME SMTH DMNDF
DATE 02 / 01 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 002 (01–03)

b. FILE IDENTIFICATION NUMBER = 9011 (73–76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)
I = 00 (77,78) J = 00 (79,80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TIME (1–3)	RECORDED VALUE (4–12)	TRUE VALUE (13–21)	NUMBER OF ENTRIES (22–25)	FILE IDENT. NUMBER (73–76)	I SUB-SCRIPT (77,78)	J SUB-SCRIPT (79,80)
01	0	1			9011	00	
02	0	1			9011	00	
03	040	1			9011	00	
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

CARD	EXPONENTIALLY SMOOTHED VALUES (1–12)
21	000

4. LAST CARD OF DATA SET (FILE PARAMETERS) (ZEROES IF NONE)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0195
b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0144
c. CURRENT INTERVAL TIME OF FIRST HAI 0440
d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE
g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/20/74
R.J.W.

CYSDEM

PERIODIC DATA FILE INITIALIZATION FORM
FOR SINGLE ENTRY FILES

PAGE 12 OF 12

FILE NAME INV LEVL F

DATE 02 / 01 / 1975
D M Y

COMPLETE DATA SET MUST BE FILLED OUT FOR EACH NON-SUBSCRIPTED FILE AND FOR EACH CHANGE IN INDEX OF A SUBSCRIPTED FILE

1. FIRST CARD OF DATA SET =

a. NUMBER OF INTERVAL SETS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS = 060 (01–03)

b. FILE IDENTIFICATION NUMBER = 0012 (73–76)

c. SUBSCRIPT VALUES FOR THIS DATA SET (ENTER ZEROES IF NONE)

I = 00 (77,78) J = 00 (79,80)

2. DATA CARDS FOR CURRENT AND HISTORIC ACCUMULATION INTERVALS (ZEROES IF NONE)

CARD	VALUE ACCESS TIME (1–3)	RECORDED VALUE (4–12)	TRUE VALUE (13–21)	NUMBER OF ENTRIES (22–25)	FILE IDENT. NUMBER (73–76)	I SUBSCRIPT (77,78)	J SUBSCRIPT (79,80)
01	90	+00.0	40.0	0000	0012		
02							
03							
04							
05							
06							
07							
08							
09	072						
10	021						
11	037						
12	063						
13							
14							
15							
16							
17							
18							
19	0??						
20	013						

20 CARDS

40 MAIs

3. SECOND LAST CARD OF DATA SET: "END-OF-FILE" EXPONENTIALLY SMOOTHED VALUES

	EXPONENTIALLY SMOOTHED VALUES (1–12)	(13–21)
21	000 +40.0	+40.0 0012

(ZEROES IF NONE)

4. LAST CARD OF DATA SET (FILE PARAMETERS)

a. AVERAGE DIFFERENCE BETWEEN ACCESS AND INTERVAL TIME 0030

b. COUNTER OF ENTRIES INTO AVERAGE ACCESS TIME 0000

c. CURRENT INTERVAL TIME OF FIRST HAI 0000000

d. MONITOR CODE
e. ACTIVITY CODE
f. ACTIVITY SUB CODE
(ENTER 0'S IF NO ACTIVITY TO BE TRIGGERED AT EACH INTERVAL CHANGE)

g. ACTIVITY TRIGGER LAG TIME (RELATIVE TO EST ACCESS TIME)

REV. 7/20/74
R.J.W.

Fig. 6.21(cont.)

DATE 1/1/75

RUN NUMBER I (73–77)

C Y S D E M

SIMULATOR INITIALIZATION DATA

1. SIMULATION STARTING TIME (IBEG) 041 (1–3)

2. SIMULATION ENDING TIME (IEND) 1000 (4–7)

3. EVENT FILE PARAMETERS . . . . . .

   (a) MAXIMUM TIME SPAN BETWEEN EVENT SCHEDULING AND EXECUTION (MME) 010 (8–10)

   (b) MAXIMUM NUMBER OF EVENTS SCHEDULED FOR ANY GIVEN TIME (NME) 010 (11–13)

   (c) MAXIMUM ADDITION OF EVENTS DURING INOW TO INOW (NA) 00 (14–15)

   (d) EVENT EXECUTION (SORT) CODE (IEVP) (0-NO SORT, 1-SORT ON EVENT CODE, 2-SORT ON EVENT CODE AND SUB-CODE) 1 (16)

4. NUMBER OF INFORMATION LINKS SPECIFIED FOR THIS SIMULATION (NIL) . . 049 (17–19)

5. NUMBER OF DISTRIBUTION PARAMETER SETS USED (NDPS) 00 (20–21)

6. NUMBER OF USER DISTRIBUTIONS SPECIFIED (NUDS) 00 (22–23)

7. NUMBER OF MARKOV I/O MATRICES TO BE READ IN (NMKV) 00 (24–25)

8. NUMBER OF ACTIVITY SPECIFICATION RECORDS (NACT) TO BE READ IN 010 (26–28)

9. ERROR PROCESSING DESIGNATION TABLE

   NUMBER OF ERROR CODES SPECIFIED (NEC): FROM ONE TO . . 61 (29–30)

   ERROR CODES (BEGIN SEPARATE CARD, COL. 1 IS ERROR CODE 1, ETC.)
   0 - IGNORE (NO ERROR MESSAGE)
   1 - NON-FATAL 2 - FATAL

1 1	11 1	21 1	31 1	41 1	51	61
2	12	22	32	42 1	52	62
3	13	23	33	43 1	53	63
4	14	24	34	44	54	64
5	15	25	35	45	55	65
6	16	26	36	46	56	66
7	17	27	37	47	57	67
8	18	28	38	48	58	68
9	19	29	39	49	59	69
10	20	30	40	50	60	70

Fig. 6.22.

(OVER)

10. EVENT-CODE/ACTIVITY-CODE EQUIVALENCE MATRIX

EVENT CODE	00		01		02		03		04		05		06		07		08		09		10		11		12	
EQUIVALENT ACTIVITY CODE	0	0	0	1	0	2	0	3	0	4	0	5	0	6	0	7	0	8	1	1	1	0				
CARD COLUMN	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

EVENT CODE	13		14		15	
EQUIVALENT ACTIVITY CODE						
CARD COLUMN	27	28	29	30	31	32

Fig. 6.22(cont.)

PAGE 1 OF 1
DATE 1/1/75
RUN I.D. # 73 76

CYSDEM EVENT FILE DATA INITIALIZATION FORM

	EVENT TIME	ACTIVITY 1		ACTIVITY 2		ACTIVITY 3		ACTIVITY 4		ACTIVITY 5		ACTIVITY 6		ACTIVITY 7		ACTIVITY 8		ACTIVITY 9		ACTIVITY 10		LINE NUMBER
		CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	CODE	SUBCODE	
col.	1 2 3	4 5	6 7 8	9 10 11 12 13		14 15 16 17 18		19 20 21 22 23		24 25 26 27 28		29 30 31 32 33		34 35 36 37 38		39 40 41 42 43		44 45 46 47 48		49 50 51 52 53		77 78 79 80
	041	01	001	03	0011	06	0001	09	0011	8888												
	045	02	001	04	0011	05	0001	07	0011	0800	1	1000	1	8888	8888							
	000																					

INSTRUCTIONS 1) ENTER DATA IN ORDER OF ASCENDING CHRONOLOGICAL TIME AS LEFT TO RIGHT TOP TO BOTTOM
2) FOR EACH NEW EVENT TIME BEGIN NEW LINE
3) PLACE ALL 8 s IN CODE AND SUBCODE FIELD IF SEQUENCE OF ACTIVITIES FOR A PARTICULAR TIME DOES NOT END WITH ACTIVITY FIELD 10
4) PLACE ALL 0 s IN THE TIME FIELD TO INDICATE END OF EVENT DESCRIPTION RECORDS

Fig. 6.23.

```
      PROGRAM    T-T(INPUT,OUTPUT,TAPE3=INPUT,TAPE4=INPUT,TAPE5=INPUT,TA
     1PE6=OUTPUT,MAT=,TAPE7=INTR)
      COMMON REUOL(129),REWOM(25),RETOM(21),REINV(137),DIUOL(153),
     1DIWOM(37),DISOM(21),DIINV(169),FAUOL(169),FAWOM(33),FACOM(21),
     2FAINV(449)

      CALL VRSG1
      CALL EVIN
      CALL VRSG2
      CALL FDTIN(REUOL)
      CALL VRSG3(REUOL)
      CALL FDTIN(REWOM)
      CALL VRSG3(REWOM)
      CALL FDTIN(RETOM)
      CALL VRSG3(RETOM)
      CALL FDTIN(REINV)
      CALL VRSG3(REINV)
      CALL FDTIN(DIUOL)
      CALL VRSG5(DIUOL)
      CALL FDTIN(DIWOM)
      CALL VRSG5(DIWOM)
      CALL FDTIN(DISOM)
      CALL VRSG2(DISOM)
      CALL FDTIN(DIINV)
      CALL VRSG3(DIINV)
      CALL FDTIN(DIINV)
      CALL VRSG3(DIINV)
      CALL FDTIN(FAUOL)
      CALL VRSG3(FAUOL)
      CALL FDTIN(FAWOM)
      CALL VRSG3(FAWOM)
      CALL FDTIN(FACOM)
      CALL VRSG3(FACOM)
      CALL FDTIN(FAINV)
      CALL VRSG3(FAINV)
      STOP
      END
```

THE MAIN PROGRAM CYSRPT

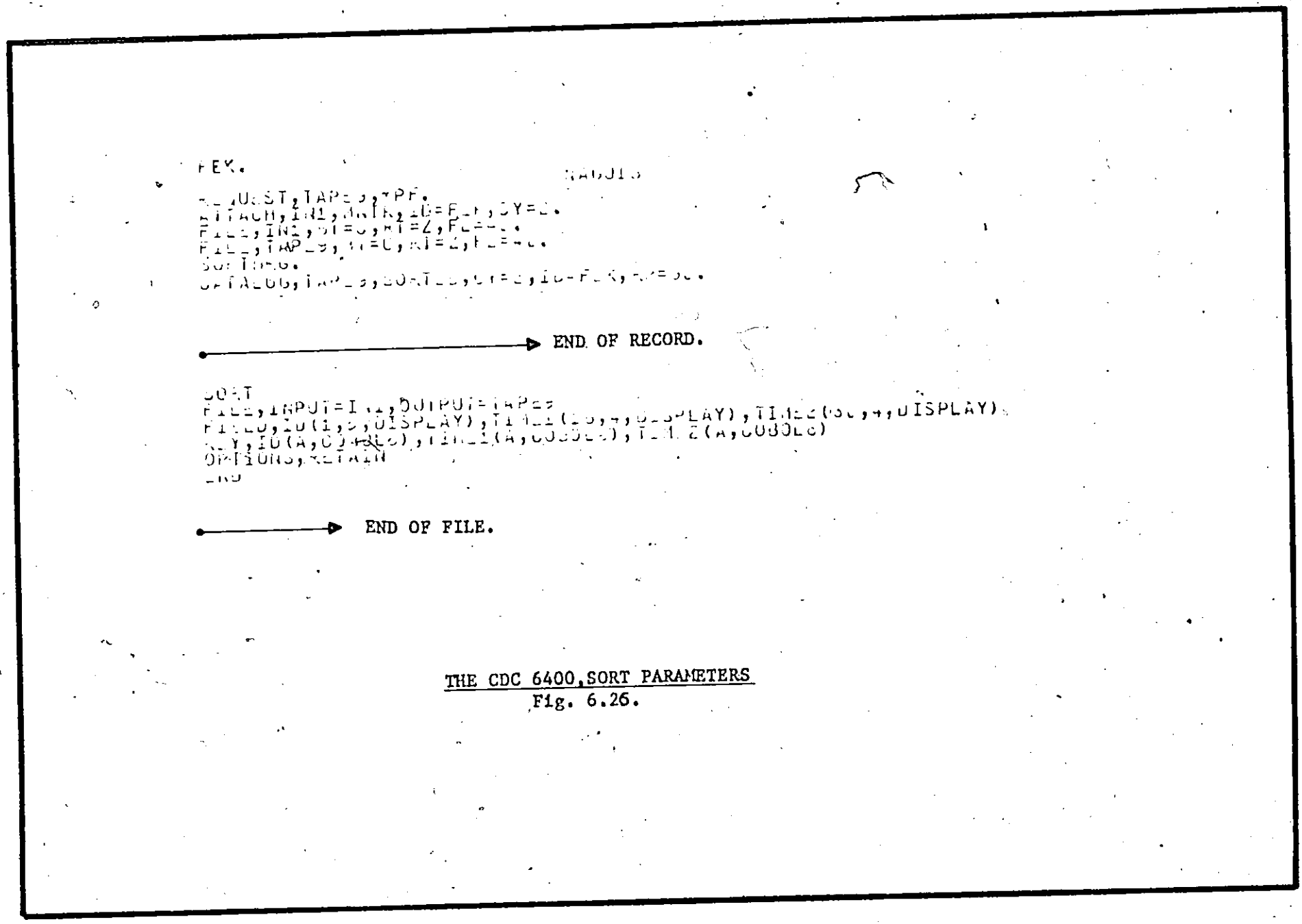
Fig. 6.24.

The Program Header Control Card. It is used,for The CDC 6400 computer.

```
      PROGRAM     TST(INPUT,OUTPUT,TAPE3=INPUT,TAPE4=INPUT,TAPE5=INPUT,TA
     1PE6=OUTPUT,MNTR,TAPE7=MNTR)
*
*
*.....THIS IS THE PROGRAM MODULE CYSIM.
*
*.....THE FOLLOWING ARRAYS ARE THE PERIODIC DATA FILES.
*
*
       COMMON REUOL(129),REWOM(25),RETSM(21),REINV(137),DIUOL(153),
      1DIWOM(37),DISSM(21),DIINV(169),FAUOL(169),FAWOM(33),FACSM(21),
      2FAINV(249)
       COMMON /GMP/INCH,IEND,IAC,IASC,IBEG,ILT
       CALL GMPIN
       CALL EVIN
       CALL FDTIN(REUOL)
       CALL FDTIN(REWOM)
       CALL FDTIN(RETSM)
       CALL FDTIN(REINV)
       CALL FDTIN(DIUCL)
       CALL FDTIN(DIWOM)
       CALL FDTIN(DISSM)
       CALL FDTIN(DIINV)
       CALL FDTIN(FAUOL)
       CALL FDTIN(FAWOM)
       CALL FDTIN(FACSM)
       CALL FDTIN(FAINV)
   50  IF (INOW.GE.IEND) GO TO 100
       CALL RMVEV
       WRITE (6,10) IAC,IASC
       CALL TRIG
       CALL USER
       GO TO 50
  100  WRITE (6,20)
   10  FORMAT(/,1X,10(1H*),19H ENTERING ACTIVITY ,I2,1H-,I3,10(1H*)//)
   20  FORMAT(/,1X,10(1H*),19H END OF SIMULATION ,10(1H*))
       STOP
       END
```

THE MAIN PROGRAM CYSIM

Fig. 6.25.



THE CDC 6400,SORT PARAMETERS
Fig. 6.26.

1 6	
00012	00001

The first card.

1 6	16 21	26 31	36 41	46 51	56 61					
FILE ID.	FILE NAME	LOWER LIMIT	UPPER LIMIT	COMPR. FACTOR	MAXAC	IDO	IQ(1)	IQ(2)	IQ(3)	IQ(4)	IQ(5)
00001	UNFLLD RDR	00001	01000	00002	00000	1	00000	00000	00011	00020	00000
00002	WKLY DMNDR	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00003	SMTH DMNDR	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00004	INV LEVL R	00001	01000	00001	00000	1	00000	00000	00011	00020	00000
00005	UNFLLD RDD	00001	01000	00001	00000	1	00000	00000	00011	00020	00000
00006	WKLY DMNDD	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00007	SMTH DMNDD	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00008	INV LEVL D	00001	01000	00001	00000	1	00000	00000	00011	00020	00000
00009	UNFLLD RDF	00001	01000	00001	00000	1	00000	00000	00011	00020	00000
00010	WKLY DMNDF	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00011	SMTH DMNDF	00001	01000	00010	00000	1	00000	00000	00011	00020	00000
00012	INV LEVL F	00001	01000	00001	00000	1	00000	00000	00011	00020	00000

Fig. 6.27.

CHAPTER 7

THE OUTPUT

1- Introduction

This chapter exhibits the output that was obtained from CYSDEM,for The Production-Distribution System of chapter 6.

2- The output of CYSRPT

The output that was obtained from CYSRPT is shown in Fig. 7.1. The last section of this output shows the initial contents of the periodic data files.

3- The output of CYSIM

CYSIM will output a printed report,providing that monitoring of the periodic data files was requested. The report contains a trace of the simulation. Each time a value is posted to a periodic data file (or push-down occurs,depending on the monitor code), a line is printed. The format of this line is shown in Figure 7.2.

4- The output of CYSTAT

CYSTAT produces the final results of the simulation. The output produced,contains time plots of the values that were stored in the periodic data files,if requested by the parameters of CYSTAT. The time plots that were obtained,show

a transient response,due to the system's initialization. The system runs in the steady state,using a daily demand value of 200 units,as explained earlier. At clock time 300,the demand is increased by 10%. The new steady state is reached, after the system passes through some transient fluctuations. The final values in the periodic data files are 10% higher than the initial values.

Figure 7.3 shows the results that corresspond to The Retail Weekly Demand File. These results include:-

1- A print-out of the parameters,that were input to CYSTAT and corresspond to the above mentioned file.
2- A time plot,that was based on the true values and the interval times.
3- A histogram of the true values.
4- Some descriptive statistics.

The same above mentioned results,but for the remaining periodic data files,are shown in Appendix IV.

C Y S D E M D A T A E D I T I N G P R O G R A M

S E G E M E N T O N E -- I N I T I A L I Z A T I O N D A T A

1. ERRORS (IF ANY) DETECTED BY SUBROUTINE GMPIN APPEAR BELOW

2. DATA FROM THE GOMS SIMULATOR INITIALIZATION FORM

A. SIMULATION BEGIN TIME.....(IBEG) 41

B. SIMULATION ENDING TIME.....(IEND) 1000

C. EVENT PROCESSING DATA

1. SPAN OF EVENTS (MAX) IN EVENT TABLE.....(MME) 10
2. EVENTS (MAX) THAT CAN BE RECORDED FOR A TIME BEFORE CURRENT SIM. TIME.....(NME) 10
3. EVENTS (MAX) THAT CAN BE ADDED TO EVENT LIST FOR THE CURRENT SIMULATION TIME.....(NA) 0
4. EVENT SORT CODE.....(IEVP) 1

D. NUMBER OF INFORMATION LINKS.....(NIL) 49

E. NUMBER OF DISTRIBUTION PARAMETER SETS.....(NDPS) 0

F. NUMBER OF USER DISTRIBUTIONS.....(NUDS) 0

G. NUMBER OF MARKOV-TYPE MATRICES.....(NMKV) 0

H. NUMBER OF ACTIVITIES TO BE SPECIFIED.....(NACT) 10

I. PROCESSING FOR ERROR CODES.....

ERROR CODE TABLE

ERROR CODE NO.	VALUE OF CODE	MEANING OF CODE
1	1	NON-FATAL
2	1	NON-FATAL
3	1	NON-FATAL
4	1	NON-FATAL
5	1	NON-FATAL
6	1	NON-FATAL
7	1	NON-FATAL
8	1	NON-FATAL
9	1	NON-FATAL
10	1	NON-FATAL

Fig. 7.1.

11	1	NON-FATAL
12	1	NON-FATAL
13	1	NON-FATAL
14	1	NON-FATAL
15	1	NON-FATAL
16	1	NON-FATAL
17	1	NON-FATAL
18	1	NON-FATAL
19	1	NON-FATAL
20	1	NON-FATAL
21	1	NON-FATAL
22	1	NON-FATAL
23	1	NON-FATAL
24	1	NON-FATAL
25	1	NON-FATAL
26	1	NON-FATAL
27	1	NON-FATAL
28	1	NON-FATAL
29	1	NON-FATAL
30	1	NON-FATAL
31	1	NON-FATAL
32	1	NON-FATAL
33	1	NON-FATAL
34	1	NON-FATAL
35	1	NON-FATAL
36	1	NON-FATAL
37	1	NON-FATAL
38	1	NON-FATAL
39	1	NON-FATAL
40	1	NON-FATAL
41	1	NON-FATAL

J. E/A MATRIX.....

EVENT-CODE / ACTIVITY-CODE
EQUIVALENCE MATRIX

EVENT CODE	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ACTIVITY CODE	0	1	2	3	4	5	6	7	8	9	10	-0	-0	-0	-0	-0

Fig. 7.1. (cont.)

ACTIVITY SPECIFICATION TABLE

ACTIVITY CODE	ACTIVITY SUBCODE	NEXT-TRIGGERING-OF-ACTIVITY CODE	NEXT-TRIGGERING-OF-ACTIVITY MEANING	NEXT-TRIGGERING-OF-ACTIVITY PRM	NEXT-TRIGGERING-OF-ACTIVITY MEANING	ACTIVITY-PROCESSING-TIME-CODES AVER TIME	OST CO	MN-VAR	U/L BND	RSLT CODE	PRM VAL	MODIFIER OF DEV.
1	1	1	FXD INTVL	1	TIME BETWN	0	0	0	0	0	0	0.00
2	1	1	FXD INTVL	5	TIME BETWN	0	0	0	0	0	0	0.00
3	1	1	FXD INTVL	1	TIME BETWN	7	0	0	0	0	0	0.00
4	1	1	FXD INTVL	5	TIME BETWN	15	0	0	0	0	0	0.00
5	1	1	FXD INTVL	5	TIME BETWN	0	0	0	0	0	0	0.00
6	1	1	FXD INTVL	1	TIME BETWN	8	0	0	0	0	0	0.00
7	1	1	FXD INTVL	5	TIME BETWN	10	0	0	0	0	0	0.00
8	1	1	FXD INTVL	5	TIME BETWN	0	0	0	0	0	0	0.00
9	1	1	FXD INTVL	1	TIME BETWN	10	0	0	0	0	0	0.00
10	1	1	FXD INTVL	5	TIME BETWN	5	0	0	0	0	0	0.00

Fig. 7.1. (cont.)

INFORMATION LINK SPECIFICATIONS
FOR 49 INFORMATION LINKS
****

1. INFORMATION LINK 2 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

2. INFORMATION LINK 3 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

3. INFORMATION LINK 4 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

4. INFORMATION LINK 5 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)

2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

5. INFORMATION LINK 6 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

6. INFORMATION LINK 7 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

7. INFORMATION LINK 8 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE

ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

8. INFORMATION LINK 9 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

9. INFORMATION LINK 10 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

10. INFORMATION LINK 11 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

11. INFORMATION LINK 12 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)

1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

12. INFORMATION LINK 13 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

13. INFORMATION LINK 14 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

14. INFORMATION LINK 15 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

15. INFORMATION LINK 16 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

16. INFORMATION LINK 17 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 3 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

17. INFORMATION LINK 18 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 3 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

18. INFORMATION LINK 19 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

19. INFORMATION LINK 20 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

20. INFORMATION LINK 21 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

21. INFORMATION LINK 22 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

22. INFORMATION LINK 23 (ILN)

A. GENERAL PROCESSING PARAMETERS

1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL. (IPT=0).

23. INFORMATION LINK 24 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

24. INFORMATION LINK 25 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 5 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

25. INFORMATION LINK 26 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED
TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

26. INFORMATION LINK 27 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

27. INFORMATION LINK 28 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

28. INFORMATION LINK 29 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

29. INFORMATION LINK 30 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

30. INFORMATION LINK 31 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

31. INFORMATION LINK 32 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

32. INFORMATION LINK 33 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 3 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

33. INFORMATION LINK 34 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 3 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

34. INFORMATION LINK 35 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

35. INFORMATION LINK 36 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

36. INFORMATION LINK 37 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

37. INFORMATION LINK 38 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

38. INFORMATION LINK 39 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

39. INFORMATION LINK 40 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

40. INFORMATION LINK 41 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 10 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

41. INFORMATION LINK 42 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

42. INFORMATION LINK 43 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

43. INFORMATION LINK 44 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

44. INFORMATION LINK 45 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

45. INFORMATION LINK 46 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE
ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

46. INFORMATION LINK 47 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 30 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY
OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE POSTED
TO ALL CURRENT ACCUMULATION INTERVALS (IPT=1).

47. INFORMATION LINK 48 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

48. INFORMATION LINK 49 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

49. INFORMATION LINK 50 (ILN)

A. GENERAL PROCESSING PARAMETERS
1. INFORMATION LINK LAG TIME= 0 (ILT)
2. UPDATE TO HAI PERMITTED- NO (ISH)

B. STOCHASTIC PROCESSING OF DATA THROUGH LINK (GARBLING)
1. DISTRIBUTION CODE IS 0 (IDC)
2. NO STOCHASTIC PROCESSING ON THIS LINK

C. THE DATA CORRECTION FACTOR TO IMPROVE THE ACCURACY OF THE GARBLED VALUE OVER TIME (RETRIEVAL ONLY) IS 0.000 (DCF(ILN))

C. UPDATES TO THE FILE ARE TO BE DONE ONLY FOR THE SPECIFIED INTERVAL (IPT=0).

NO PARAMETER SETS SPECIFIED (NDPS=0)

```
NO USER DISTRIBUTIONS SPECIFIED  (NUDS=0)
```


Fig. 7.1.(cont.)

```
NO I-O / MARKOV TRANSFORMATIONS SPECIFIED (NMKV=0)
```


Fig. 7.1.(cont.)

```
**************************************************
*END OF PROCESSING FOR SEGMENT ONE OF INPUT DATA*
*       VALIDATION AND REPORTING PROGRAM         *
**************************************************
```

```
S E G M E N T    T W O -- E V E N T   T A B L E
*************************************************

1. ERRORS (IF ANY) DETECTED BY SUBROUTINE EVIN

2. EVENT PROCESSING VALUES (FROM GMPIN)
   A. SIMULATION START TIME.....(IBEG)    41
   B. SIMULATION ENDING TIME.....(IEND)  1000
   C. TIME SPREAD OF EVENT TABLE.....(MME)   10
   D. MAX. EVENTS THAT CAN BE SCHEDULED
      FOR ANY GIVEN TIME WITHIN EVENT
      TABLE OTHER THAN AT CURRENT (INOW)
      SIMULATION CLOCK TIME.....(NME)    10
   E. MAX. EVENTS THAT CAN BE ADDED TO
      EVENT TABLE FOR TIME INOW AT
      CURRENT CLOCK TIME INOW.....(NA)     0
   F. SEQUENCE OF ACTIVITY EXECUTION
      FOR MULTIPLE EVENTS AT INOW.....(IEVP)   1
      1. IEVP=0 - NO SORT (FIFO)
      2. IEVP=1 - SORT ONLY ON EVENT CODE
      3. IEVP=2 - SORT ON EVENT CODE AND SUB-CODE

3. EVENT TABLE FOLLOWS ON NEXT PAGE
```

Fig. 7.1.(cont.)

INITIAL EVENT TABLE

EVENT TIME	ACTIVITIES (NOT NECESSARILY IN THEIR SEQUENCE OF EXECUTION)					
	CD-SCD-	CD-SCD-	CD-SCD-	CD-SCD-	CD-SCD-	CD-SCD-
41	1- 1	3- 1	6- 1	9- 1		
45	2- 1	4- 1	5- 1	7- 1	8- 1	10- 1

```
**********************************************
*END OF PROCESSING FOR SEGMENT TWO OF INPUT DATA*
*       VALIDATION AND REPORTING PROGRAM       *
**********************************************
```

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT
FOR FILE UNFLLDORDR WITH I.D. 1

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 129
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 10
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 20

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 10
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING HAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	50	50- 50	1400.000	1400.000	0
2	49	49- 49	1400.000	1400.000	0
3	48	48- 48	1400.000	1400.000	0
4	47	47- 47	1400.000	1400.000	0
5	46	46- 46	1400.000	1400.000	0
6	45	45- 45	1400.000	1400.000	0
7	44	44- 44	1400.000	1400.000	0
8	43	43- 43	1400.000	1400.000	0

Fig. 7.1.(cont.)

9	42	42- 42	1400.000	1400.000	0
10	41	41- 41	1400.000	1400.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	40	40- 40	1400.000	1400.000	0
2	39	39- 39	1400.000	1400.000	0
3	38	38- 38	1400.000	1400.000	0
4	37	37- 37	1400.000	1400.000	0
5	36	36- 36	1400.000	1400.000	0
6	35	35- 35	1400.000	1400.000	0
7	34	34- 34	1400.000	1400.000	0
8	33	33- 33	1400.000	1400.000	0
9	32	32- 32	1400.000	1400.000	0
10	31	31- 31	1400.000	1400.000	0
11	30	30- 30	1400.000	1400.000	0
12	29	29- 29	1400.000	1400.000	0
13	28	28- 28	1400.000	1400.000	0
14	27	27- 27	1400.000	1400.000	0
15	26	26- 26	1400.000	1400.000	0
16	25	25- 25	1400.000	1400.000	0
17	24	24- 24	1400.000	1400.000	0
18	23	23- 23	1400.000	1400.000	0
19	22	22- 22	1400.000	1400.000	0
20	21	21- 21	1400.000	1400.000	0

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
20- 0	1400.000	1400.000	0.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY TRIGGER LAG TIME	EVENT CODE	SUB-CODE
0	1	40	NVPO+POOP	NONE SPECIFIED		

****

E N D O F R E P O R T F O R F I L E UNFLLOOROR

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
WKLY CMNDR	2

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 3
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 25
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 1
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 3

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 5
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES
1	45	45- 41	0.000	0.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES

1	40	40- 36	1000.000	1000.000	5
2	35	35- 31	1000.000	1000.000	5
3	30	30- 26	1000.000	1000.000	5

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
25- 0	1000.000	1000.000	5.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
0	1	40	NVPO+PDOP	NONE	SPECIFIED	

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E N D O F R E P O R T F O R F I L E WKLY DMNDR

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT
FOR FILE WITH I.D.

SMTH CMNDR 3

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 5
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 21
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 2
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 1

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 10
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED MOST RECNT	TRUE MOST RECNT	NUMBER ENTRIES
1	50	50- 46	1000.000	1000.000	0
2	45	45- 41	1000.000	1000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT	ACC.	TIME	RECORDED	TRUE	NUMBER

NO.	TIME RANGE	MOST RECNT	MOST RECNT	ENTRIES
1	40 40- 36	1000.000	1000.000	1

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
35- 0	1000.000	1000.000	1.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY TRIGGER LAG TIME	EVENT CODE	SUB-CODE
0	1	40	NVPO+PDOP	NONE SPECIFIED		

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E N D O F R E P O R T F O R F I L E SMTH DMNDR

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE INV LEVL R WITH I.D. 4

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 137
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 12
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 20

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 12
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	57	52- 52	8000.000	8000.000	0
2	56	51- 51	8000.000	8000.000	0
3	55	50- 50	8000.000	8000.000	0
4	54	49- 49	8000.000	8000.000	0
5	53	48- 48	8000.000	8000.000	0
6	52	47- 47	8000.000	8000.000	0
7	51	46- 46	8000.000	8000.000	0
8	50	45- 45	8000.000	8000.000	0

9	49	44- 44	8000.000	8000.000	0
10	48	43- 43	8000.000	8000.000	0
11	47	42- 42	8000.000	8000.000	0
12	46	41- 41	8000.000	8000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	45	40- 40	8000.000	8000.000	2
2	44	39- 39	8000.000	8000.000	2
3	43	38- 38	8000.000	8000.000	2
4	42	37- 37	8000.000	8000.000	2
5	41	36- 36	8000.000	8000.000	2
6	40	35- 35	8000.000	8000.000	2
7	39	34- 34	8000.000	8000.000	2
8	38	33- 33	8000.000	8000.000	2
9	37	32- 32	8000.000	8000.000	2
10	36	31- 31	8000.000	8000.000	2
11	35	30- 30	8000.000	8000.000	2
12	34	29- 29	8000.000	8000.000	2
13	33	28- 28	8000.000	8000.000	2
14	32	27- 27	8000.000	8000.000	2
15	31	26- 26	8000.000	8000.000	2
16	30	25- 25	8000.000	8000.000	2
17	29	24- 24	8000.000	8000.000	2
18	28	23- 23	8000.000	8000.000	2
19	27	22- 22	8000.000	8000.000	2
20	26	21- 21	8000.000	8000.000	2

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
20- 0	8000.000	8000.000	2.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY TRIGGER LAG TIME	EVENT CODE	SUB-CODE
5	1	40	NVPO+PDOP	NONE	SPECIFIED	

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E N D O F R E P O R T F O R F I L E INV-LEVL R

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT
FOR FILE WITH I.D.

UNFLLCORDO 5

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 153
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 16
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 20

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 16
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	59	56- 56	1600.000	1600.000	0
2	58	55- 55	1600.000	1600.000	0
3	57	54- 54	1600.000	1600.000	0
4	56	53- 53	1600.000	1600.000	0
5	55	52- 52	1600.000	1600.000	0
6	54	51- 51	1600.000	1600.000	0
7	53	50- 50	1600.000	1600.000	0
8	52	49- 49	1600.000	1600.000	0

9	51	48- 48	1600.000	1600.000	0
10	50	47- 47	1600.000	1600.000	0
11	49	46- 46	1600.000	1600.000	0
12	48	45- 45	1600.000	1600.000	0
13	47	44- 44	1600.000	1600.000	0
14	46	43- 43	1600.000	1600.000	0
15	45	42- 42	1600.000	1600.000	0
16	44	41- 41	1600.000	1600.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	43	40- 40	1600.000	1600.000	2
2	42	39- 39	1600.000	1600.000	2
3	41	38- 38	1600.000	1600.000	2
4	40	37- 37	1600.000	1600.000	2
5	39	36- 36	1600.000	1600.000	2
6	38	35- 35	1600.000	1600.000	2
7	37	34- 34	1600.000	1600.000	2
8	36	33- 33	1600.000	1600.000	2
9	35	32- 32	1600.000	1600.000	2
10	34	31- 31	1600.000	1600.000	2
11	33	30- 30	1600.000	1600.000	2
12	32	29- 29	1600.000	1600.000	2
18	31	28- 28	1600.000	1600.000	2
14	30	27- 27	1600.000	1600.000	2
15	29	26- 26	1600.000	1600.000	2
16	28	25- 25	1600.000	1600.000	2
17	27	24- 24	1600.000	1600.000	2
18	26	23- 23	1600.000	1600.000	2
19	25	22- 22	1600.000	1600.000	2
20	24	21- 21	1600.000	1600.000	2

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
20- 0	1600.000	1600.000	2.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
3	1	40	NVPO+PDOP	NONE SPECIFIED		

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E N D O F R E P O R T F O R F I L E UNFLLOORDO

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
WKLY DMNDO	6

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 3
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 37
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 4
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 3

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 20
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES
1	63	60- 56	1000.000	1000.000	0
2	58	55- 51	1000.000	1000.000	0
3	53	50- 46	1000.000	1000.000	0
4	48	45- 41	1000.000	1000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES
1	43	40- 36	1000.000	1000.000	1
2	38	35- 31	1000.000	1000.000	1
3	33	30- 26	1000.000	1000.000	1

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
25- 0	1000.000	1000.000	1.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
3	1	40	NVPO+PDOP	NONE	SPECIFIED	

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E N D O F R E P O R T F O R F I L E HKLY DMNOD

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
SMTH DMOO	7

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 5
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 21
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 2
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 1

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 10
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED MOST RECNT	TRUE MOST RECNT	NUMBER ENTRIES
1	50	50- 46	1000.000	1000.000	0
2	45	45- 41	1000.000	1000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	RECORDED	TRUE	NUMBER

NO.	TIME RANGE	MOST RECNT INTVL	MOST RECNT VALUE	ENTRIES
1	40 40- 36	1000.000	1000.000	1

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL	RECORDED VALUE	TRUE INTVL	TRUE VALUE	NO. OF ENTRIES
35- 0		1000.000		1000.000	1.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
0	1	40	NVPO+PDOP	NONE SPECIFIED.		

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E N D O F R E P O R T F O R F I L E SMTH DMNDD

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
INV LEVL 0	8

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 169
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 20
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 20

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 20
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	70	60- 60	6000.000	6000.000	0
2	69	59- 59	6000.000	6000.000	0
3	68	58- 58	6000.000	6000.000	0
4	67	57- 57	6000.000	6000.000	0
5	66	56- 56	6000.000	6000.000	0
6	65	55- 55	6000.000	6000.000	0
7	64	54- 54	6000.000	6000.000	0
8	63	53- 53	6000.000	6000.000	0

9	62	52- 52	6000.000	6000.000	0
10	61	51- 51	6000.000	6000.000	0
11	60	50- 50	6000.000	6000.000	0
12	59	49- 49	6000.000	6000.000	0
13	58	48- 48	6000.000	6000.000	0
14	57	47- 47	6000.000	6000.000	0
15	56	46- 46	6000.000	6000.000	0
16	55	45- 45	6000.000	6000.000	0
17	54	44- 44	6000.000	6000.000	0
18	53	43- 43	6000.000	6000.000	0
19	52	42- 42	6000.000	6000.000	0
20	51	41- 41	6000.000	6000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO CLOSEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	50	40- 40	6000.000	6000.000	2
2	49	39- 39	6000.000	6000.000	2
3	48	38- 38	6000.000	6000.000	2
4	47	37- 37	6000.000	6000.000	2
5	46	36- 36	6000.000	6000.000	2
6	45	35- 35	6000.000	6000.000	2
7	44	34- 34	6000.000	6000.000	2
8	43	33- 33	6000.000	6000.000	2
9	42	32- 32	6000.000	6000.000	2
10	41	31- 31	6000.000	6000.000	2
11	40	30- 30	6000.000	6000.000	2
12	39	29- 29	6000.000	6000.000	2
13	38	28- 28	6000.000	6000.000	2
14	37	27- 27	6000.000	6000.000	2
15	36	26- 26	6000.000	6000.000	2
16	35	25- 25	6000.000	6000.000	2
17	34	24- 24	6000.000	6000.000	2
18	33	23- 23	6000.000	6000.000	2
19	32	22- 22	6000.000	6000.000	2
20	31	21- 21	6000.000	6000.000	2

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
20- 0	6000.000	6000.000	2.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
10	1	40.	NVPO+PDOP	NONE SPECIFIED		

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E N D O F R E P O R T F O R F I L E INV LEVL D

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
UNFLLOORDF	9

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 169
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 20
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 20

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 20
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	63	60- 60	2000.000	2000.000	0
2	62	59- 59	2000.000	2000.000	0
3	61	58- 58	2000.000	2000.000	0
4	60	57- 57	2000.000	2000.000	0
5	59	56- 56	2000.000	2000.000	2
6	58	55- 55	2000.000	2000.000	2
7	57	54- 54	2000.000	2000.000	2
8	56	53- 53	2000.000	2000.000	2

9	55	52- 52	2000.000	2000.000	2
10	54	51- 51	2000.000	2000.000	2
11	53	50- 50	2000.000	2000.000	2
12	52	49- 49	2000.000	2000.000	2
13	51	48- 48	2000.000	2000.000	2
14	50	47- 47	2000.000	2000.000	2
15	49	46- 46	2000.000	2000.000	2
16	48	45- 45	2000.000	2000.000	2
17	47	44- 44	2000.000	2000.000	2
18	46	43- 43	2000.000	2000.000	2
19	45	42- 42	2000.000	2000.000	2
20	44	41- 41	2000.000	2000.000	2

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	43	40- 40	2000.000	2000.000	2
2	42	39- 39	2000.000	2000.000	2
3	41	38- 38	2000.000	2000.000	2
4	40	37- 37	2000.000	2000.000	2
5	39	36- 36	2000.000	2000.000	2
6	38	35- 35	2000.000	2000.000	2
7	37	34- 34	2000.000	2000.000	2
8	36	33- 33	2000.000	2000.000	2
9	35	32- 32	2000.000	2000.000	2
10	34	31- 31	2000.000	2000.000	2
11	33	30- 30	2000.000	2000.000	2
12	32	29- 29	2000.000	2000.000	2
13	31	28- 28	2000.000	2000.000	2
14	30	27- 27	2000.000	2000.000	2
15	29	26- 26	2000.000	2000.000	2
16	28	25- 25	2000.000	2000.000	2
17	27	24- 24	2000.000	2000.000	2
18	26	23- 23	2000.000	2000.000	2
19	25	22- 22	2000.000	2000.000	2
20	24	21- 21	2000.000	2000.000	2

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
20- 0	2000.000	2000.000	2.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
3	1	40	NVPO+POOP	NONE SPECIFIED		

****

E N D O F R E P O R T F O R F I L E UNFLLDORDF

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
WKLY CHNQF	10

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 3
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 33
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 3
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 3

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE AHEAD OF CURRENT SIMULATION TIME...(MSA) 15
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES
1	58	55- 51	1000.000	1000.000	0
2	53	50- 46	1000.000	1000.000	0
3	48	45- 41	1000.000	1000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED SUM	TRUE SUM	NUMBER ENTRIES
1	43	40- 36	1000.000	1000.000	1
2	38	35- 31	1000.000	1000.000	1
3	33	30- 26	1000.000	1000.000	1

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
25- 0	1000.000	1000.000	1.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
3	1	40	NVPO+POOP	NONE SPECIFIED		

****

E N D O F R E P O R T F O R F I L E WKLY DMNDF

C Y S D E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
SMTH DMNDF	11

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 5
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 5

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 21
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 2
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 1

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 10
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED MOST RECNT	TRUE MOST RECNT	NUMBER ENTRIES
1	50	50- 46	1000.000	1000.000	0
2	45	45- 41	1000.000	1000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT	ACC.	TIME	RECORDED	TRUE	NUMBER

NO.	TIME RANGE	MOST RECNT	MOST RECNT	ENTRIES
1	40 40- 36	1000.000	1000.000	1

C. EXPONENTIALLY SMOOTHED RCLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
35- 0	1000.000	1000.000	1.

D. END OF FILE PARAMETER VALUES

AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
0	1	40	NVPO+PDOP	NONE SPECIFIED		

****

E N D O F R E P O R T F O R F I L E SMTH DMNDF

C Y S O E M DATA FILE
PARAMETERS AND CONTENT REPORT

FOR FILE	WITH I.D.
INV LEVL F	12

I. FILE PARAMETERS (FROM FILE PARAMETER SPEC. FORM)

A. FILE TYPE.....(IFT) 6
WHERE THE FILE TYPE SIGNIFIES --
1-LARGEST VALUE TAKEN FOR INTERVAL
2-SMALLEST TAKEN
3-SUM OF ALL VALUES IN INTERVAL
4-MEAN AND STD-DEV. OF ALL
5-MOST RECENT VALUE IS INTERVAL VALUE
6-LEVEL FILE

B. TIME WIDTH OF FILE INTERVALS.....(INTS) 1

C. FILE DIMENSIONS
1. TIME SUBSCRIPT.....(L) 249
(OVER ACCUMULATION INTERVALS)
2. FIRST SUBSCRIPT OF NAMED FILE.....(M) 1
(IF 01 THEN NONE)
3. SECOND SUBSCRIPT OF NAMED FILE.....(N) 1
(IF 01 THEN NONE)

D. NUMBERS OF ACCUMULATION INTERVALS
1. CURRENT ACCUMULATION INTERVALS....(NCA) 20
2. HISTORIC ACCUMULATION INTERVALS...(NHA) 40

E. SMOOTHING FACTORS FOR ROLL-OFF VALUES
1. RECORDED VALUES.....(A1) .100
2. TRUE VALUES.....(A2) .100

F. MAXIMUM TIME-INTERVAL FOR DATA STORE
AHEAD OF CURRENT SIMULATION TIME...(MSA) 20
IN STU-S)

G. NO NEGATIVE BALANCE LEVEL FILE PROCESSING WAS SPECIFIED

II. FILE CONTENTS

A. CURRENT ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	90	60- 60	4000.000	4000.000	0
2	89	59- 59	4000.000	4000.000	0
3	88	58- 58	4000.000	4000.000	0
4	87	57- 57	4000.000	4000.000	0
5	86	56- 56	4000.000	4000.000	0
6	85	55- 55	4000.000	4000.000	0
7	84	54- 54	4000.000	4000.000	0
8	83	53- 53	4000.000	4000.000	0

9	82	52- 52	4000.000	4000.000	0
10	81	51- 51	4000.000	4000.000	0
11	80	50- 50	4000.000	4000.000	0
12	79	49- 49	4000.000	4000.000	0
13	78	48- 48	4000.000	4000.000	0
14	77	47- 47	4000.000	4000.000	0
15	76	46- 46	4000.000	4000.000	0
16	75	45- 45	4000.000	4000.000	0
17	74	44- 44	4000.000	4000.000	0
18	73	43- 43	4000.000	4000.000	0
19	72	42- 42	4000.000	4000.000	0
20	71	41- 41	4000.000	4000.000	0

B. HISTORICAL ACCUMULATION INTERVAL VALUES
(MOST CURRENT TO OLDEST)

INT NO.	ACC. TIME	TIME RANGE	RECORDED LEVEL	TRUE LEVEL	NUMBER ENTRIES
1	70	40- 40	4000.000	4000.000	0
2	69	39- 39	4000.000	4000.000	0
3	68	38- 38	4000.000	4000.000	0
4	67	37- 37	4000.000	4000.000	0
5	66	36- 36	4000.000	4000.000	0
6	65	35- 35	4000.000	4000.000	0
7	64	34- 34	4000.000	4000.000	0
8	63	33- 33	4000.000	4000.000	0
9	62	32- 32	4000.000	4000.000	0
10	61	31- 31	4000.000	4000.000	0
11	60	30- 30	4000.000	4000.000	2
12	59	29- 29	4000.000	4000.000	2
13	58	28- 28	4000.000	4000.000	2
14	57	27- 27	4000.000	4000.000	2
15	56	26- 26	4000.000	4000.000	2
16	55	25- 25	4000.000	4000.000	2
17	54	24- 24	4000.000	4000.000	2
18	53	23- 23	4000.000	4000.000	2
19	52	22- 22	4000.000	4000.000	2
20	51	21- 21	4000.000	4000.000	2
21	50	20- 20	4000.000	4000.000	2
22	49	19- 19	4000.000	4000.000	2
23	48	18- 18	4000.000	4000.000	2
24	47	17- 17	4000.000	4000.000	2
25	46	16- 16	4000.000	4000.000	2
26	45	15- 15	4000.000	4000.000	2
27	44	14- 14	4000.000	4000.000	2
28	43	13- 13	4000.000	4000.000	2
29	42	12- 12	4000.000	4000.000	2
30	41	11- 11	4000.000	4000.000	2
31	40	10- 10	4000.000	4000.000	2
32	39	9- 9	4000.000	4000.000	2
33	38	8- 8	4000.000	4000.000	2
34	37	7- 7	4000.000	4000.000	2
35	36	6- 6	4000.000	4000.000	2
36	35	5- 5	4000.000	4000.000	2
37	34	4- 4	4000.000	4000.000	2
38	33	3- 3	4000.000	4000.000	2
39	32	2- 2	4000.000	4000.000	2
40	31	1- 1	4000.000	4000.000	2

C. EXPONENTIALLY SMOOTHED ROLL-OFF VALUES

TIME RANGE	RECORDED INTVL VALUE	TRUE INTVL VALUE	NO. OF ENTRIES
0- 0	4000.000	4000.000	2.

D. END OF FILE PARAMETER VALUES

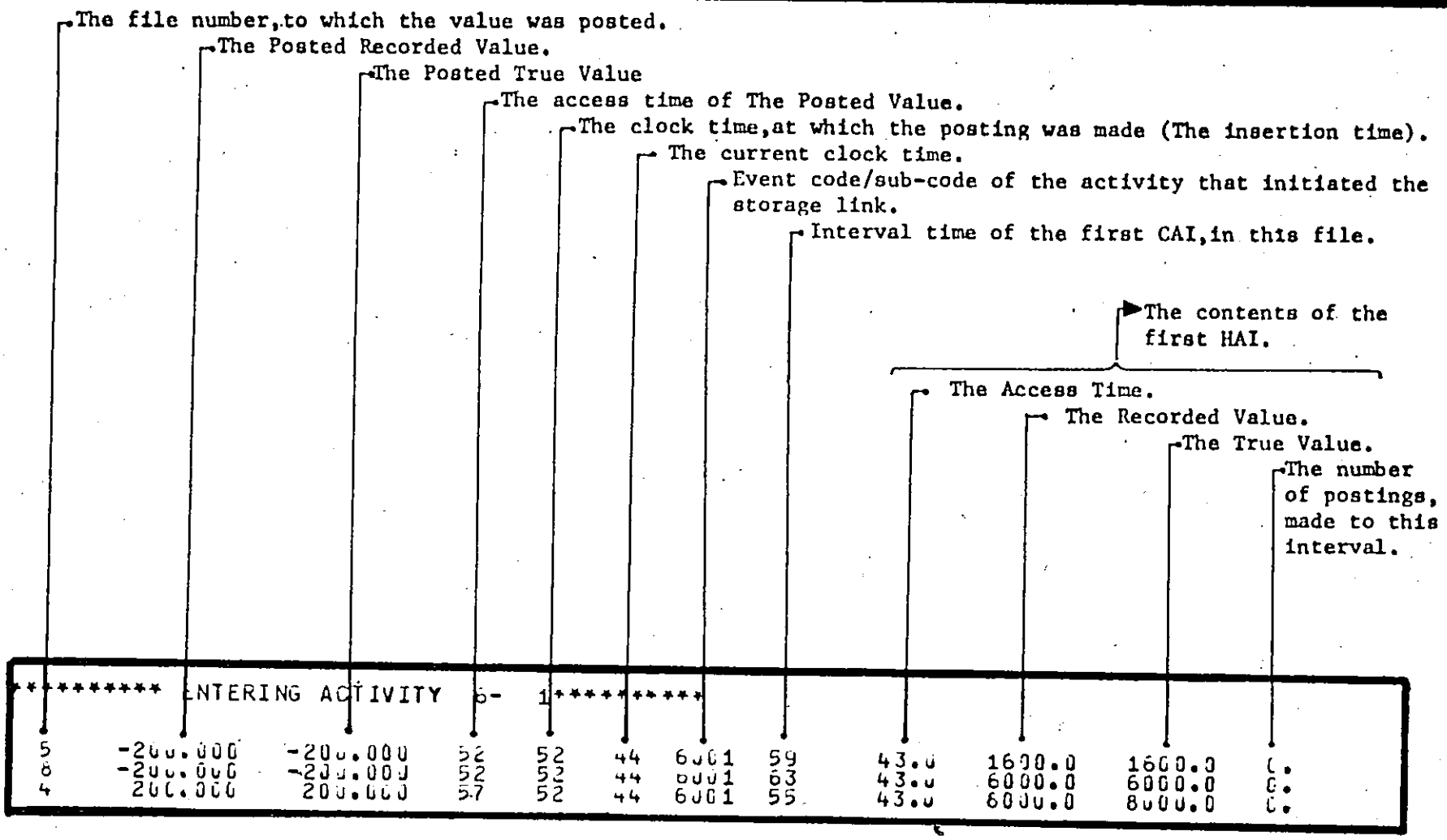
AVERAGE ACCESS TIME	ENTRY COUNT TO AAT	HAI INTERVAL TIME	MONITOR CODE MEANING	ACTIVITY LAG TIME	TRIGGER EVENT CODE	TRIGGER SUB-CODE
30	1	40	NVPO+POOP	NONE SPECIFIED		

****

E N D O F R E P O R T F O R F I L E INV LEVL F

END-OF-FILE ENCOUNTERED, FILENAME - INPUT
ERROR NUMBER 0065 DETECTED BY INPC= AT ADDRESS 000134
CALLED FROM FDTIN AT LINE 0017
CALLED FROM TST AT LINE 0035

Fig. 7.1.(cont)



FORMAT OF THE PRINT-OUT
FROM CYSIM
Fig. 7.2

CYSDEM OUTPUT STATISTICS

FOR

WKLY DMNOR FILE NUMBER 2
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM	1 TO 1000
TIME COMPRESSION FACTOR IS ..... THIS IS USED FOR COMPRESSION OF PLOTS ONLY	10
MAXIMUM ACTIVITY CODE ..... IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED	0
PROCESS VALUE1 + VALUE2 OR VALJE1 ONLY.....	VALUE 1
PRINT TABLES.....	NO
PUNCH ON FILE7.....	NO
WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT IF ZERO, NO PLOTS ARE PRINTED.....	11
NO. OF INTERVALS ON THE HISTOGRAM (GROUPS) HAVE UP TO 20 INTERVALS IF ZERO, NO HISTOGRAM PRINTED.....	20
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS	0

FILE NO. 2 WKLY DMNOR HAS 191 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 995

NUMBER OF PERIODS FOR VALUE2 = 44

Fig. 7.3.

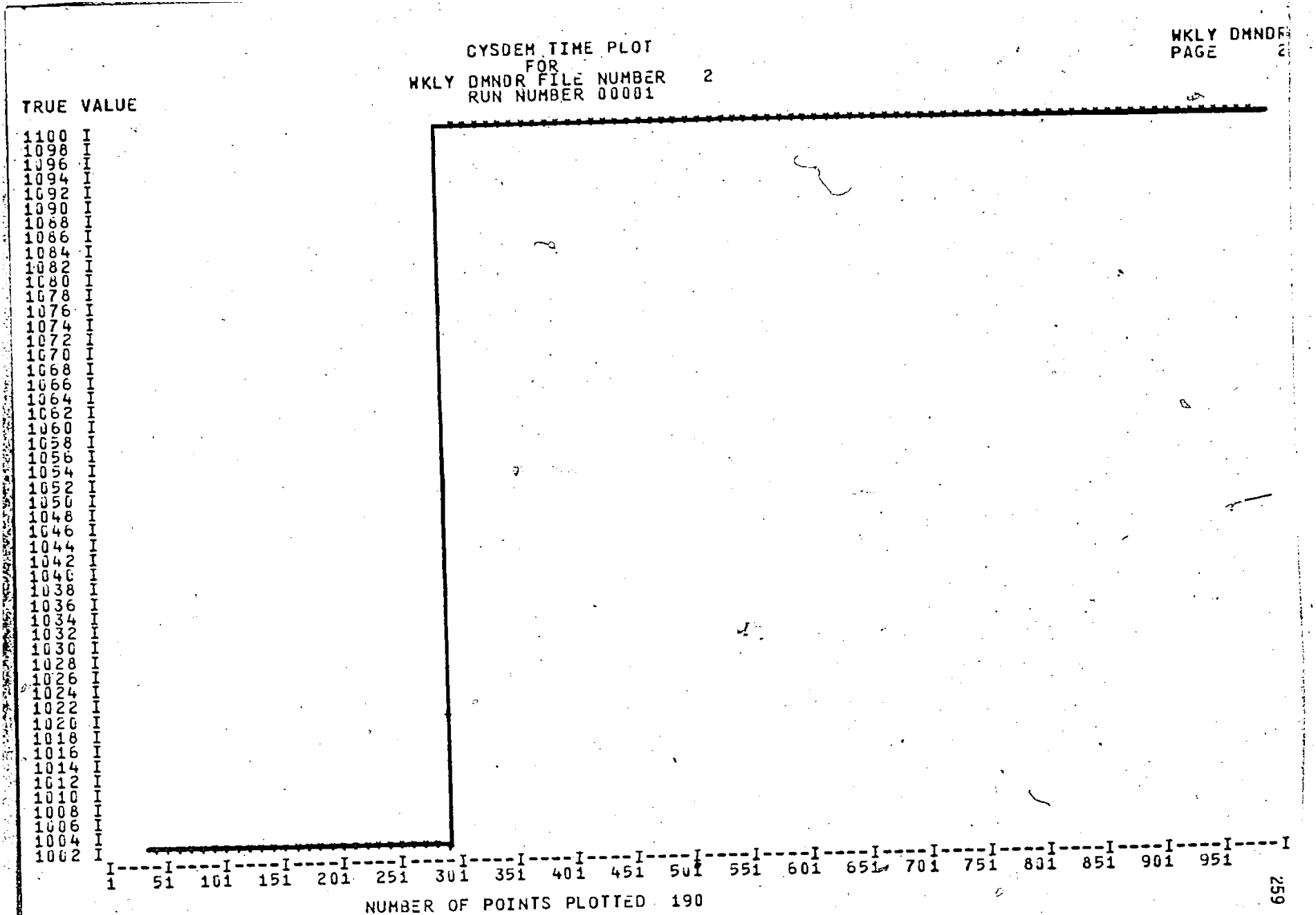

CYSDEM TIME PLOT
FOR
WKLY DMNDR FILE NUMBER 2
RUN NUMBER 00001
TRUE VALUE
1100
1098
1096
1094
1092
1090
1088
1086
1084
1082
1080
1078
1076
1074
1072
1070
1068
1066
1064
1062
1060
1058
1056
1054
1052
1050
1048
1046
1044
1042
1040
1038
1036
1034
1032
1030
1028
1026
1024
1022
1020
1018
1016
1014
1012
1010
1008
1006
1004
1002
1 51 101 151 201 251 301 351 401 451 501 551 601 651 701 751 801 851 901 951
NUMBER OF POINTS PLOTTED 190

Fig. 7.3.(cont.)

C Y S D E M

HISTOGRAM AND STATISTICS

WKLY OMNOR FILE NUMBER 2
RUN NUMBER 00001

INTERVAL	FROM	TO	FREQUENC
1	1000.0000	1005.0000	255
2	1005.0000	1010.0000	0
3	1010.0000	1015.0000	0
4	1015.0000	1020.0000	0
5	1020.0000	1025.0000	0
6	1025.0000	1030.0000	0
7	1030.0000	1035.0000	0
8	1035.0000	1040.0000	0
9	1040.0000	1045.0000	0
10	1045.0000	1050.0000	0
11	1050.0000	1055.0000	0
12	1055.0000	1060.0000	0
13	1060.0000	1065.0000	0
14	1065.0000	1070.0000	0
15	1070.0000	1075.0000	0
16	1075.0000	1080.0000	0
17	1080.0000	1085.0000	0
18	1085.0000	1090.0000	0
19	1090.0000	1095.0000	0
20	1095.0000	1100.0000	691

MIDPOINT OF 1ST INTERVAL 1002.5000

INTERVAL WIDTH 5.0000

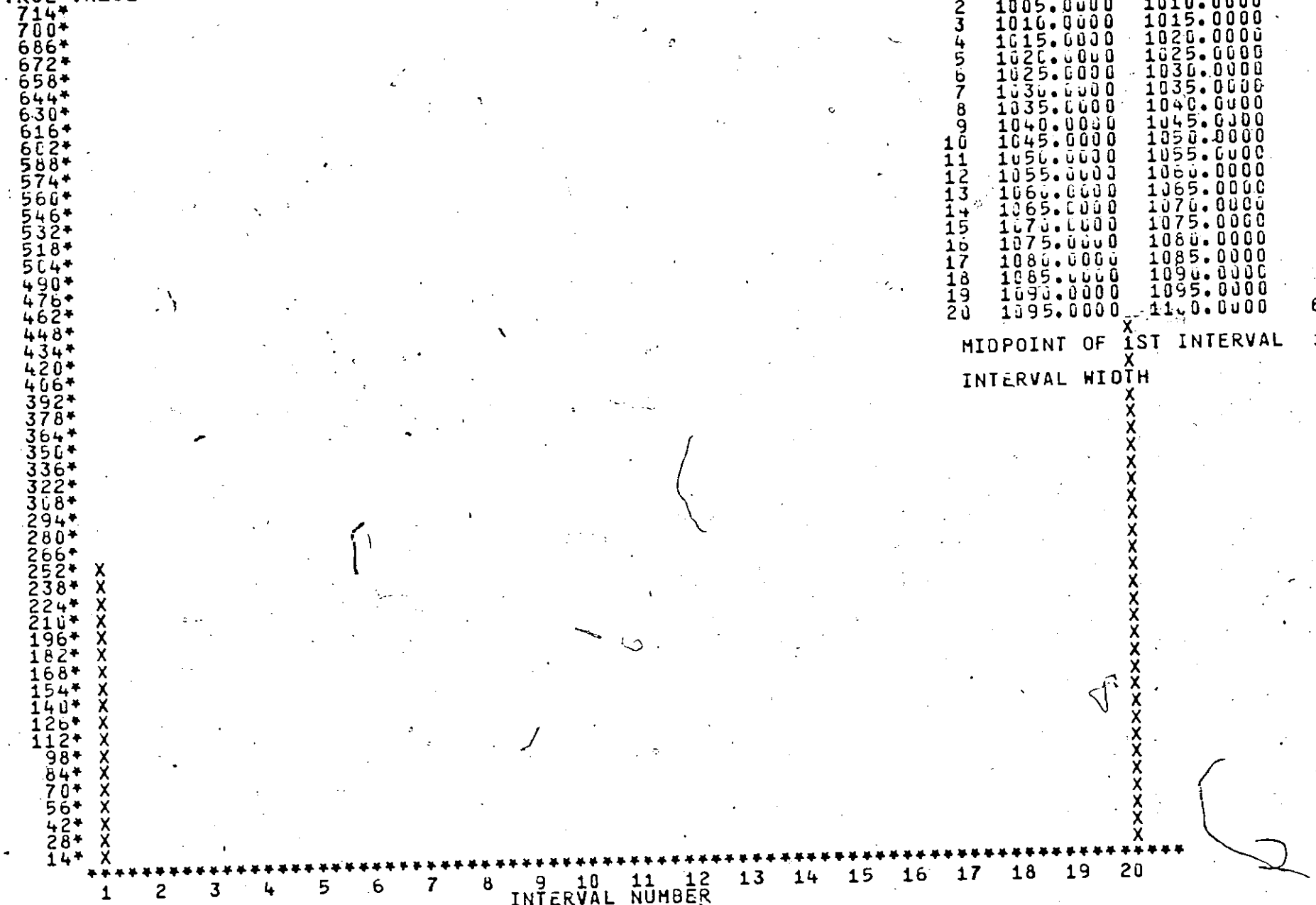


Fig. 7.3.(cont.)

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

WKLY OMNOR FILE NUMBER 2
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	951
MINIMUM SCORE.....	1000.0000
MAXIMUM SCORE.....	1100.0000
RANGE.....	100.0000
SUM OF SCORES.....	1020200.00
SUM OF SQUARES.....	1096312000.00
MEAN.....	1072.7655
STANDARD ERROR OF THE MEAN	1.4405
STANDARD DEVIATION...	44.4221
VARIANCE.....	1973.3194
THIRD MOMENT.....	-89403.3692
FOURTH MOMENT.....	7957794.5313
SKEWNESS.....	-1.019901
KURTOSIS.....	-.956390
THE MEDIAN VALUE.....	1100.0000
THE MODE VALUE.....	1097.5000
THE MODE FREQUENCY...	691.0000

Fig. 7.3.(cont.)

APPENDIX I

CYSDEM

ERROR CODE DESCRIPTIONS

ERROR CODE	DESCRIPTION OF CONDITION	MEANING OF OUTPUT VALUES (E1, E2, E3, E4)
10	NUMBER OF INFO LINK READ IN EXCEEDS DIMENSION OF STORAGE (FATAL) [GMPIN]	E1-INFORMATION LINK NUMBER E2-UPPER BOUND PERMITTED
11	NUMBER OF PARAMETER SET READ IN EXCEEDS DIMENSION FOR STORAGE (FATAL) [GMDIN]	E1-PARAMETER SET NUMBER E2-UPPER BOUND PERMITTED
12	FIRST VALUE FOR USER DISTRIBUTION RANDOM VALUE NOT ZERO (FATAL) [GMPIN]	E1-USER DISTRIBUTION NUMBER E2-VALUE READ IN FIRST
13	RANDOM VALUES FOR USER DISTRIBUTION NOT IN ASCENDING SEQUENCE (FATAL) [GMPIN]	E1-USER DISTRIBUTION NUMBER E2-VALUES OUT OF SEQUENCE E3- "
14	LAST RANDOM VALUE READ IN FOR USER DISTRIBUTION EXCEEDS ONE (FATAL) [GMPIN)	E1-USER DISTRIBUTION NUMBER E2-RANDOM VALUE E3-RANDOM DEVIATE
15	LAST RANDOM VALUE READ IN (10TH CARD) DOES NOT HAVE A RANDOM VALUE OF 1.000 (VALUE IS SET TO ONE) [GMPIN]	E1-USER DISTRIBUTION NUMBER E2-RANDOM VALUE E3-RANDOM DEVIATE
16	DISAGREEMENT BETWEEN THE NUMBER OF ACCUM. INTERVALS GIVEN ON THE FILE PARAMETER SHEET AND THAT GIVEN ON THE FILE DATA SHEET (FATAL) [FDTIN]	E1-FILE NUMBER E2-NUMBER ON FILE SPEC FORM (NHA + NCA + 1) E3-NUMBER ON FILE DATA FORM
17	NUMBER OF PARAMETER SET READ IN EXCEEDS MAXIMUM VALUE [GMPIN]	E1:USER DISTRIBUTION NUMBER E2:MAXIMUM VALUE
18	ILLEGAL VALUE(S) READ IN FOR ACTIVITY CODE AND/OR SUBCODE - MUST BE GREATER THAN ZERO (FATAL) [GMPIN]	E1:ACTIVITY CODE READ IN E2:ACTIVITY SUBCODE READ IN
19	OUT-OF-SEQUENCE ERROR IN USER DISTRIBUTION CODE, FIRST VALUE READ IN FOR SPECIFIC TABLE DOES NOT AGREE WITH A SUBSEQUENT VALUE GIVEN FOR USER DISTRIBUTION (FATAL) [GMPIN]	E1:FIRST USER DIST. NO. (FROM 1ST CARD) E2:VALUE OF SUBSEQUENT CARD E3:CARD NUMBER IN DISAGREEMENT
20	EVENT DATA INPUT LINE SEQUENCE CHECK [EVIN]	E1:LINE NUMBER E2:TIME ASSOCIATED WITH ERROR LINE
21	EVENT DATA INPUT TIME SEQUENCE CHECK (FATAL) [EVIN]	E1:LINE NUMBER E2:PREVIOUS TIME E3:ERROR LINE TIME
22	EVENT DATA INPUT ILLEGAL ACTIVITY CODE (FATAL) [EVIN]	E1:LINE NUMBER E2:ACTIVITY CODE E3:FIELD

23	EVENT DATA INPUT ILLEGAL ACTIVITY SUBCODE (FATAL) [EVIN]	E1:LINE NUMBER E2:ACTIVITY SUBCODE E3:FIELD
24	EVENT FILE WIDTH EXCEEDED IN INPUT OF INITIAL EVENTS (FATAL) [EVIN]	E1:EVENT TIME OF VIOLATION E2:LINE OF VIOLATION E3:CALCULATED MAXIMUM
25	IN REMOVING EVENTS, THE NUMBER OF EVENTS EXCEEDS THE NUMBER THAT CAN BE STORED (FATAL) [RMVEV]	E1:EVENT TIME OF VIOLATION E2:NUMBER OF EVENTS REMAINING IN COUNTER NMEV E3:INDEX OF COUNTER
26	ATTEMPT TO INSERT EVENT WITH A TIME LESS THAN CURRENT PROCESSING TIME [EVNTS]	E1:CURRENT TIME E2:ATTEMPTED TIME OR INSERTION E3:IVENT CODE AND SUBCODE
27	ATTEMPT TO INSERT EVENT BEYOND RANGE OF FILE FUTURE TIME [EVNTS]	E1:CURRENT TIME E2:ATTEMPTED TIME OF INSERTION E3:EVENT CODE AND SUBCODE
28	ATTEMPT TO INSERT EVENT INTO TIME THAT ALREADY HAS MAXIMUM NUMBER OF EVENTS POSSIBLE [EVNTS]	E1:EVENT TIME E2:EVENT CODE AND SUBCODE E3:NUMBER NOW IN FILE
29	ATTEMPT TO INSERT EVENT INTO CURRENT FILE THAT IS AT CAPACITY [EVNTS]	E1:EVENT TIME E2:EVENT CODE AND SUBCODE E3:NUMBER OF EVENTS ON FILE
30	ATTEMPT TO STORE NEW VALUE BEYOND PERMISSIBLE FUTURE [STR]	E1:FILE ID E2:SUBSCRIPTS E3:TIME TO STORAGE E4:CURRENT TIME
31	REQUESTED RETRIEVAL BEYOND RANGE OF HAI'S-EXPONENTIALLY SMOOTHED VALUE SET RETURNED [RTV]	E1:ACTIVITY CODE AND SUBCODE OF REQUESTOR E2:TIME INTERVAL REQUESTED E3:NUMBER OF HAI'S CARRIED
32	REQUEST FOR NEXT EVENT GOES BEYOND END OF SIMULATION (IEND) (FATAL) [RMVEV]	E1:INOW E2:IEND E3,E4:LAST EVENT PROCESSED E3:CODE E4:SUBCODE
33	ATTEMPT TO ACCESS A SUBSCRIPT OUT OF DEFINED RANGE (FATAL) [RTV]	E1:FILE NUMBER E2:IRX*1000+JRX E3:M*1000+N E4:0
34	ATTEMPT TO ACCESS A SUBSCRIPT OUT OF DEFINED RANGE (FATAL) [STR]	E1:FILE NUMBER E2:IRX*1000+JRX E3:M*1000+N E4:0
40	RANDOM NUMBER VALUE EXCEEDS LAST RANDOM VALUE OF DISTRIBUTION [UDIST]	E1:USER DISTRIBUTION NUMBER E2:RANDOM NUMBER E3:LAST VALUE OF RANDOM VALUES
41	ATTEMPT TO OBTAIN STANDARD DEVIATION FROM NON-STATISTICAL FILE [GBL] ACTION: (SD←MEAN)	E1:LINK NUMBER E2:DISTRIBUTION CODE FOR MEAN E3: " " " σ

APPENDIX II

HOW TO USE THE ERROR ROUTINE

The user may extend the error reporting facility of CYSDEM by defining his own errors. The error codes for these errors must be greater than 41. The first 41 error codes are defined and used by the library subroutines.

The error routine will output a message, as shown in Figure 1 of this Appendix. To use the routine, the user must do the following:-

1- Set the variables E1,E2,E3 and E4 to four variables that will be reported, if the error occurs.

2- Issue the following FORTRAN call:-

CALL ERROR(m)

where m is the error code, that was defined by the user. The COMMON block ERR, must be defined in the program segment where the call appears.

```
*****************************************************************
*  ERROR    * ACTIVITY * SIMULATION * VALUE1=          8.000 *
* DETECTED  * CODE AND *    TIME    * VALUE2=        101.000 *
*-----------* SUBCODE  *------------* VALUE3=        457.000 *
* CODE=30   *  9-  1   *     434    * VALUE4=        433.000 *
*****************************************************************
```

Fig. 1.

APPENDIX III

RESTRICTIONS AND LIMITATIONS ON CYSDEM

1- The minimum hardware configuration is:-

   a- Card reader.

   b- Line printer.

   c- One disc spindle.

   d- A processor,with floating point logic.

2- The memory requirements for The Production-Distribution System were 54K. The CDC word is 60 bits and numerics are represented internally in octal. All the CYSDEM library subroutines are called in memory,even if some of these subroutines are not used. However,this may be overcome by dividing the subroutines into two or more sets:-

   a- The first set is the basic set,which is always laoded in memory and is independant from the particular system being analysed. For example, the subroutines that handle the events list.

   b- The second set(s) is optional and is dependant on the systen being analysed. For example,there is no need to load the subroutines that handle transaction entities,if no transaction entities exist in the system.

Again,to reduce the memory requirements,there is no need to load the subroutines that are not required by the main program,that is going to be executed. For example, there is no need to load the input and validation subr-

outines,if CYSIM is going to be executed next.

The implementation of the above memory saving procedures, depends on the particular operating system,being used. For example,on the NCR CENTURY,it may be implemented by using control strings and appropriate monitor flags settings.

3- The current version of CYSDEM contains a CDC COMPASS subroutine. This subroutine is used to pack five activity codes/sub-codes into one CDC word. However,this subroutine may be removed from CYSDEM,with minor changes.

APPENDIX IV

THE RESULTS OF THE PRODUCTION-DISTRIBUTION SYSTEM

The results,from CYSTAT,for the eleven periodic data files are shown here. The results,corressponding to The Retail Weekly Demand File are shown in Figure 7.3.

NO. OF IDS TO BE PROCESSED 12
RUN NUMBER 00001

CYSDEM OUTPUT STATISTICS

FOR

UNFLLOORDR FILE NUMBER 1
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 2
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

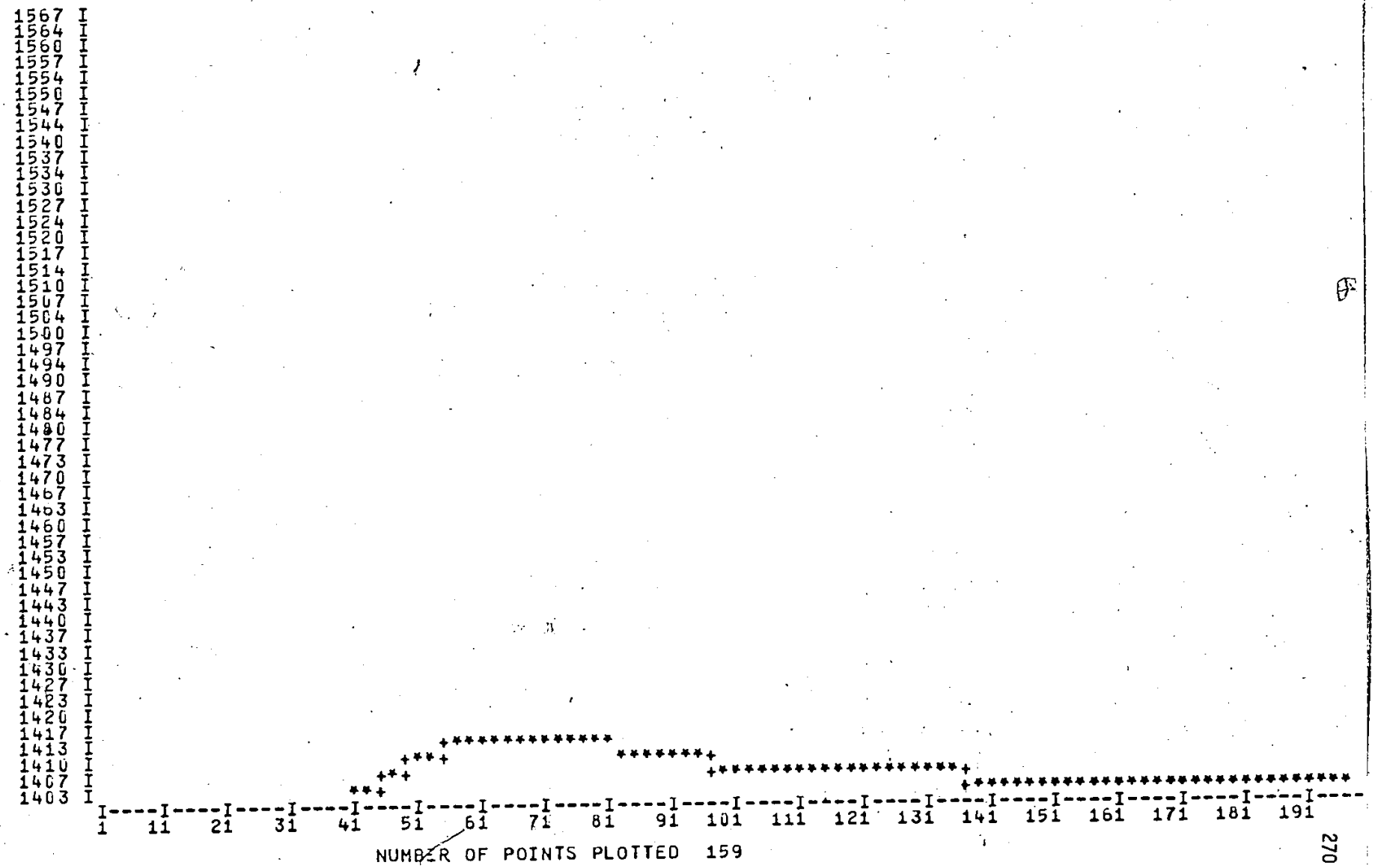
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 1 UNFLLDORDR HAS 959 DATA POINT ON FILE9

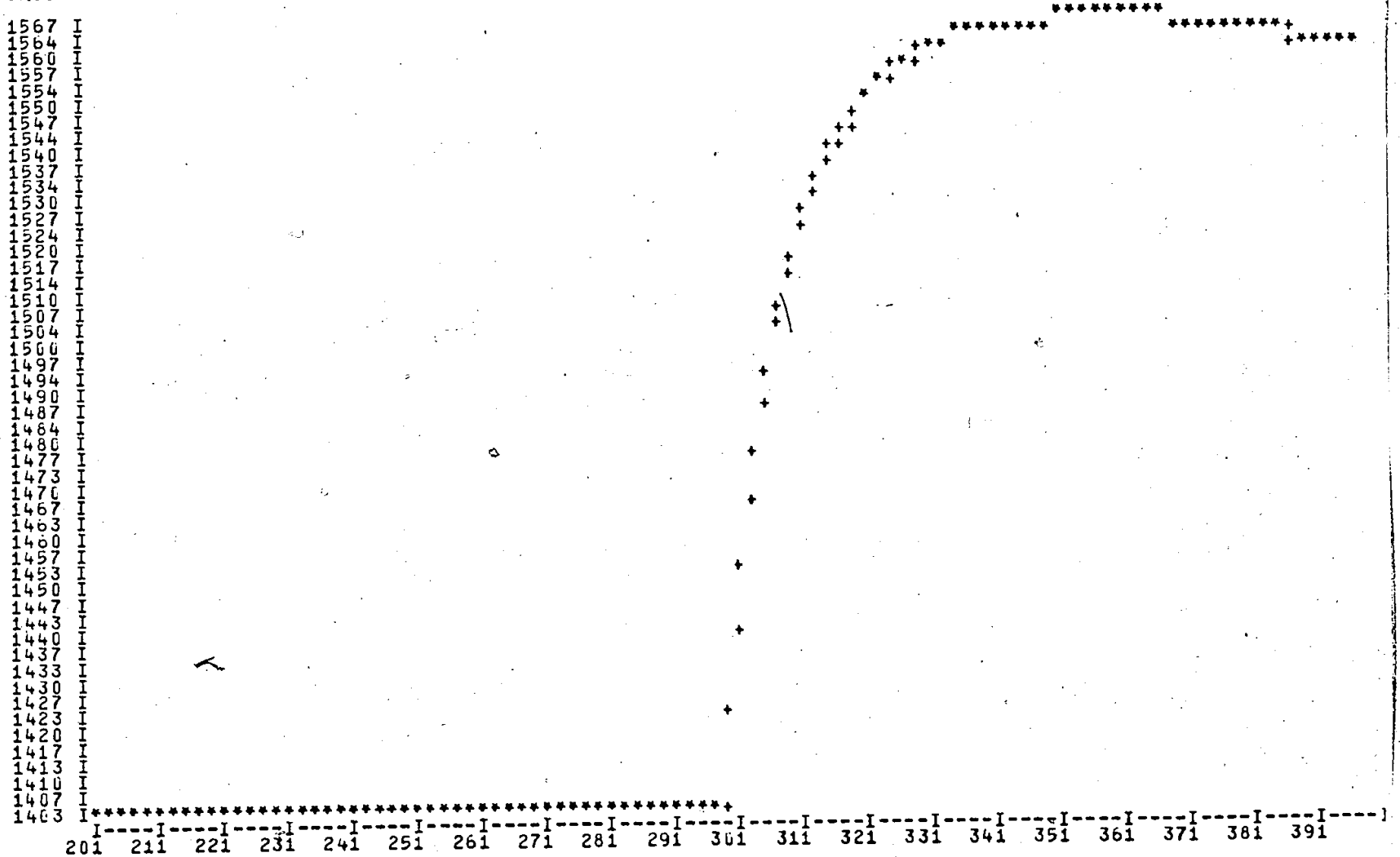
NUMBER OF PERIODS FOR VALUE1 = 999

NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001

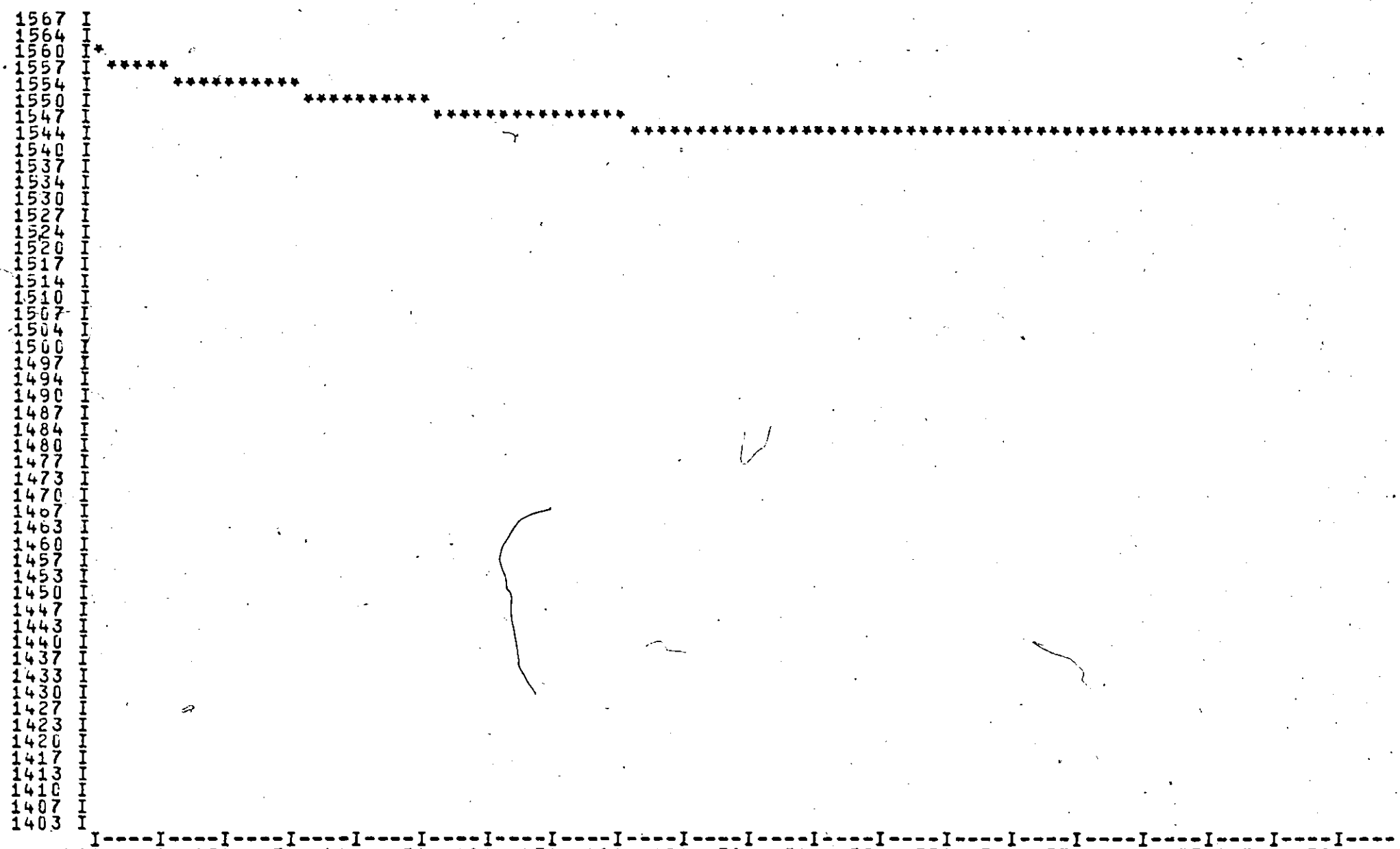


CYSDEM TIME PLOT
FOR
UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001



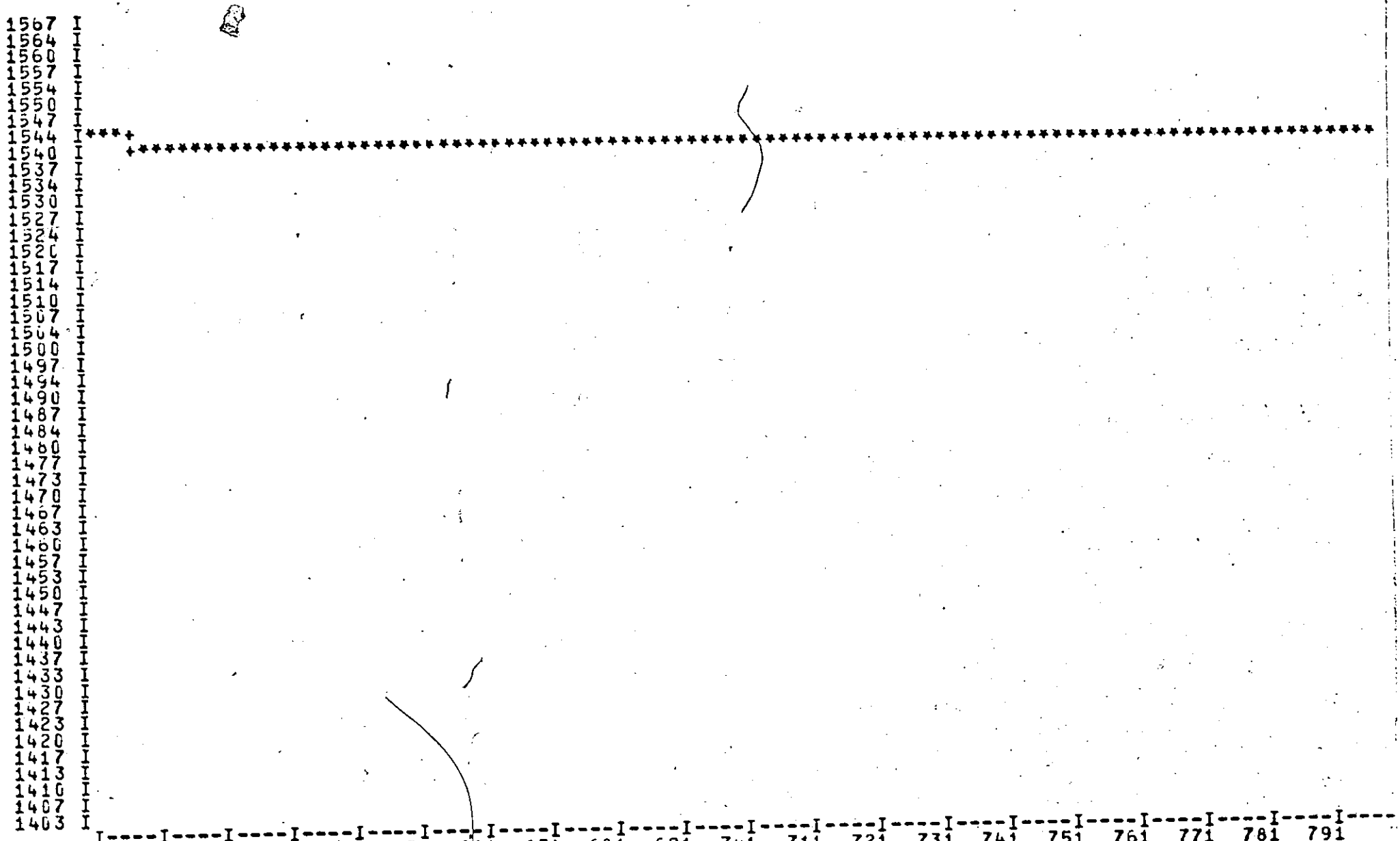
NUMBER OF POINTS PLOTTED 199

CYSDEM TIME PLOT
FOR
UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001



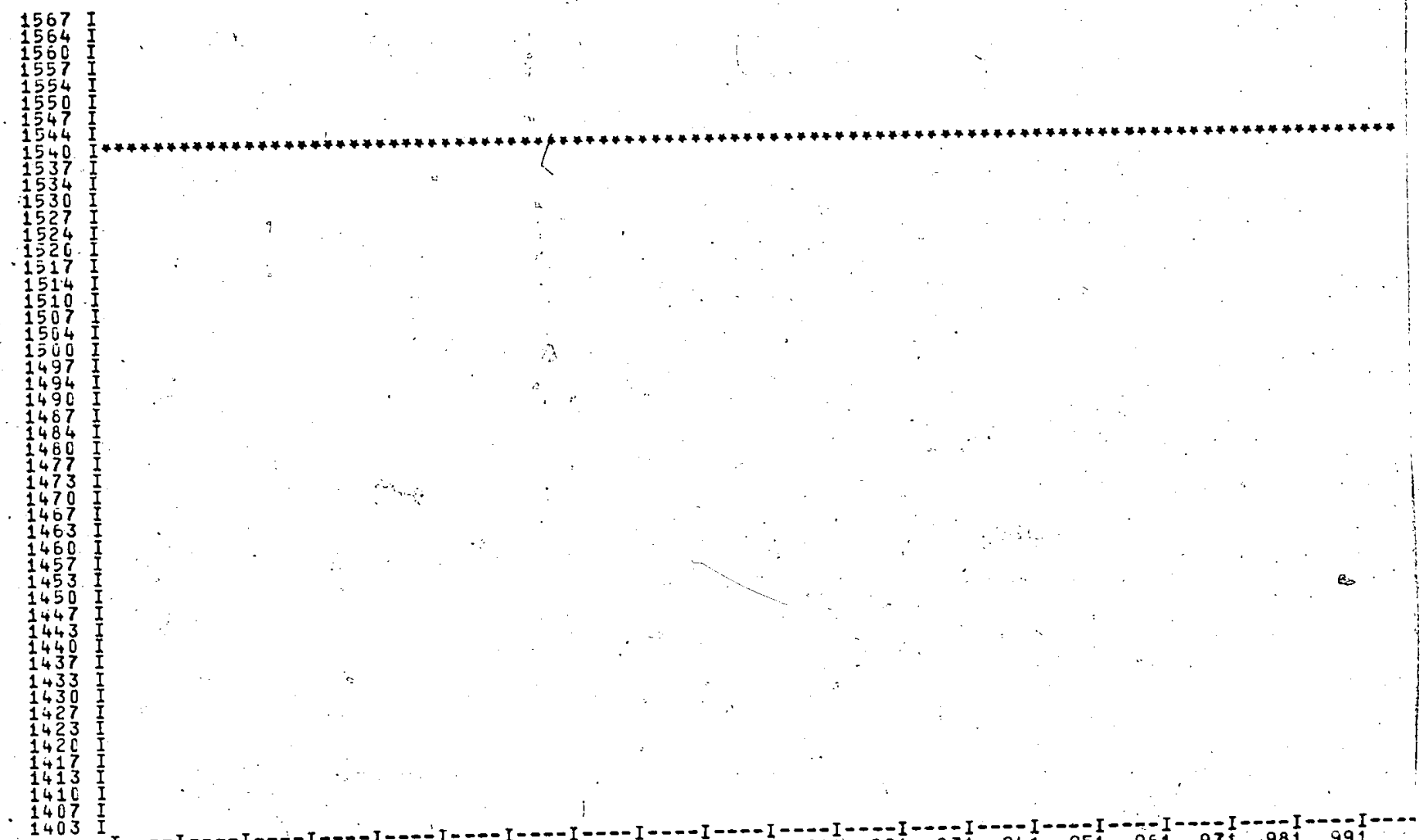
NUMBER OF POINTS PLOTTED 199

CYSDEM TIME PLOT
FOR
UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 199

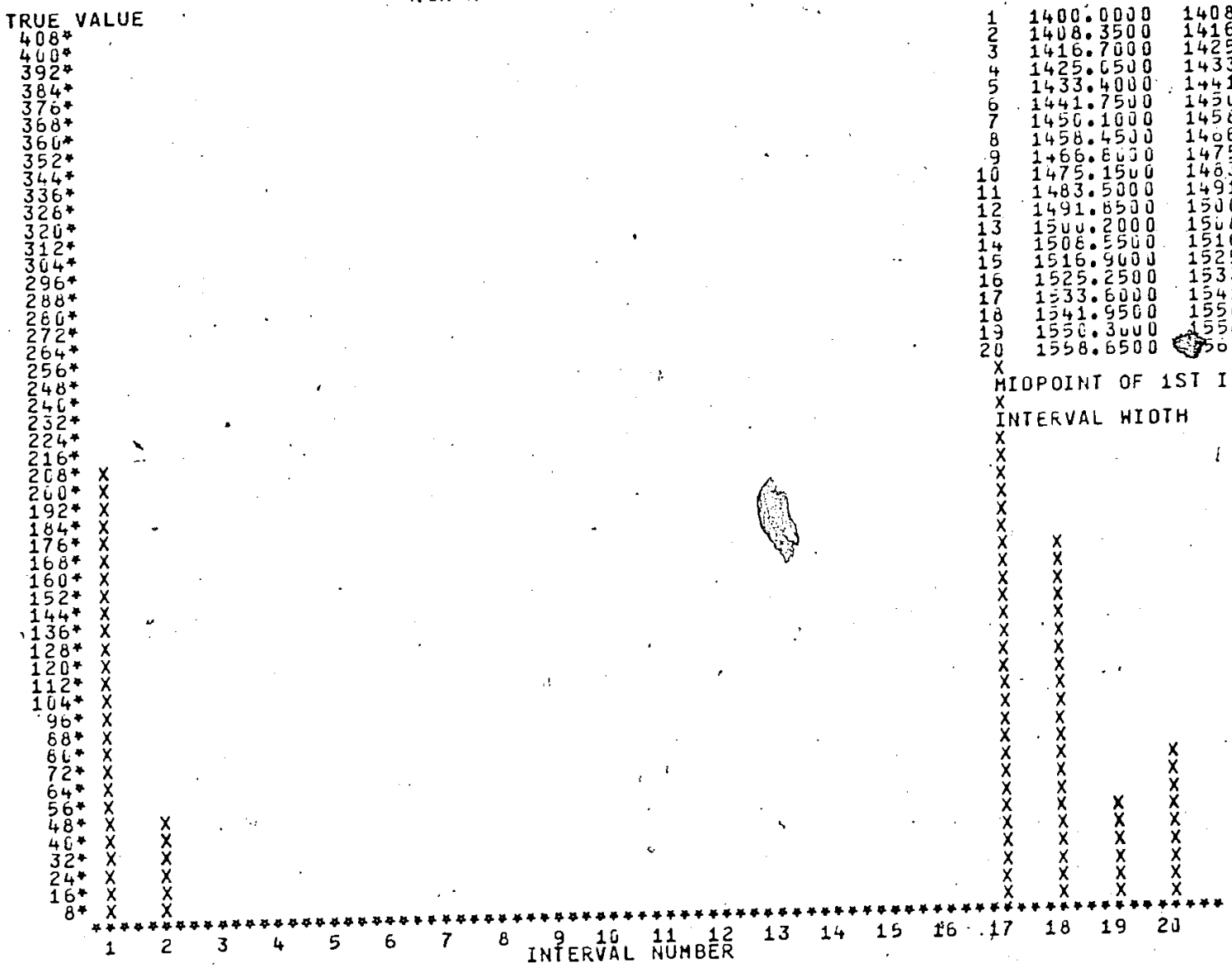
CYSDEM TIME PLOT
FOR
UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 198

C Y S O E M
HISTOGRAM AND STATISTICS

UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUE
1	1400.0000	1408.3500	211
2	1408.3500	1416.7000	48
3	1416.7000	1425.0500	1
4	1425.0500	1433.4000	0
5	1433.4000	1441.7500	1
6	1441.7500	1450.1000	0
7	1450.1000	1458.4500	1
8	1458.4500	1466.8000	1
9	1466.8000	1475.1500	0
10	1475.1500	1483.5000	1
11	1483.5000	1491.8500	1
12	1491.8500	1500.2000	1
13	1500.2000	1508.5500	2
14	1508.5500	1516.9000	1
15	1516.9000	1525.2500	2
16	1525.2500	1533.6000	3
17	1533.6000	1541.9500	395
18	1541.9500	1550.3000	169
19	1550.3000	1558.6500	48
20	1558.6500	1567.0000	73

MIDPOINT OF 1ST INTERVAL 1404.17

INTERVAL WIDTH 8.35

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

UNFLLDORDR FILE NUMBER 1
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	959
MINIMUM SCORE.....	1400.0000
MAXIMUM SCORE.....	1567.0000
RANGE.....	167.0000
SUM OF SCORES.....	1444566.00
SUM OF SQUARES.....	2179742930.00
MEAN.....	1506.3253
STANDARD ERROR OF THE MEAN	2.0210
STANDARD DEVIATION...	62.5873
VARIANCE.....	3917.1642
THIRD MOMENT.....	-238810.3741
FOURTH MOMENT.....	31068709.7500
SKEWNESS.....	-.974682
KURTOSIS.....	-.975212
THE MEDIAN VALUE.....	1541.0000
THE MODE VALUE.....	1537.7750
THE MODE FREQUENCY...	395.0000

CYSDEM OUTPUT STATISTICS

FOR

SMTH DMNDR FILE NUMBER 3
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 10
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

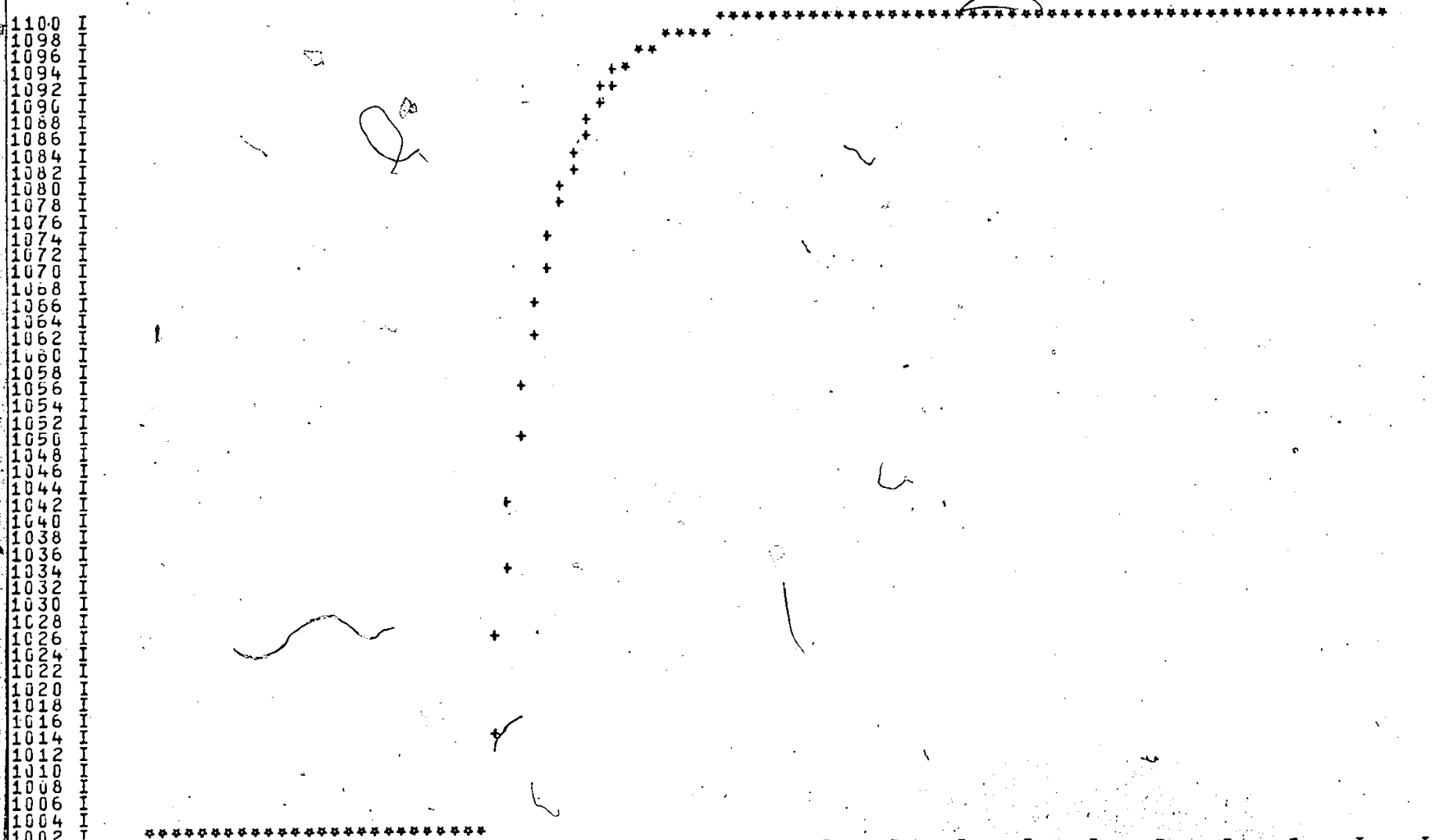
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 3 SMTH DMNDR HAS 190 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 990

NUMBER OF PERIODS FOR VALUE2 = 44

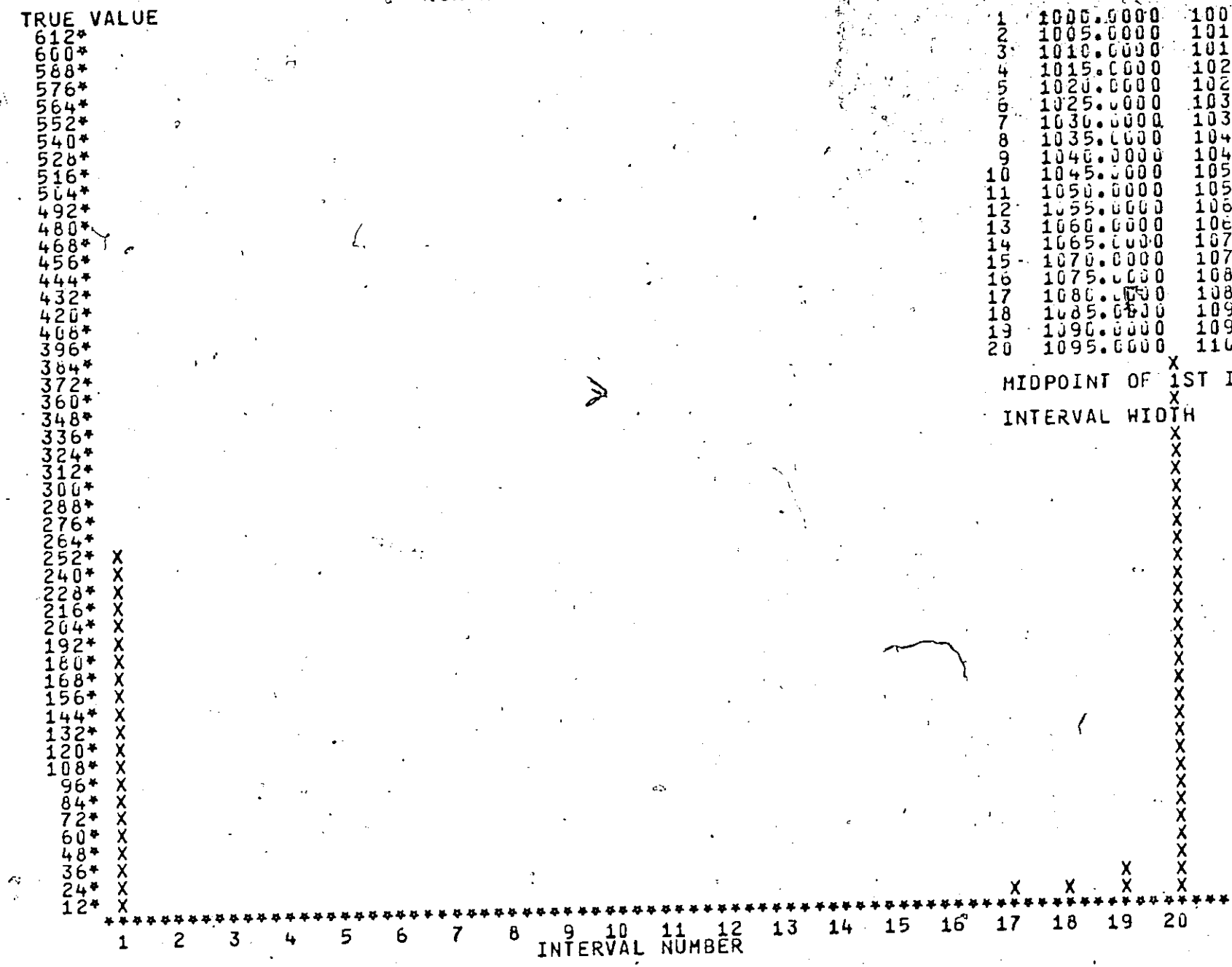
CYSDEM TIME PLOT
FOR
SMTH DMNDR FILE NUMBER 3
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 189

C Y S O E M
HISTOGRAM AND STATISTICS

SMTH DMNOR FILE NUMBER 3
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	1000.0000	1005.0000	260
2	1005.0000	1010.0000	0
3	1010.0000	1015.0000	0
4	1015.0000	1020.0000	0
5	1020.0000	1025.0000	0
6	1025.0000	1030.0000	0
7	1030.0000	1035.0000	0
8	1035.0000	1040.0000	0
9	1040.0000	1045.0000	0
10	1045.0000	1050.0000	0
11	1050.0000	1055.0000	0
12	1055.0000	1060.0000	0
13	1060.0000	1065.0000	0
14	1065.0000	1070.0000	0
15	1070.0000	1075.0000	1
16	1075.0000	1080.0000	0
17	1080.0000	1085.0000	1
18	1085.0000	1090.0000	2
19	1090.0000	1095.0000	2
20	1095.0000	1100.0000	570

MIDPOINT OF 1ST INTERVAL 1002.5000

INTERVAL WIDTH 5.0000

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

SMTH DMNDR FILE NUMBER 3
RUN NJMBER 00001

	TRUE VALUE
NUMBER OF VALUES.....	946
MINIMUM SCORE.....	1000.0000
MAXIMUM SCORE.....	1100.0000
RANGE.....	100.0000
SUM OF SCORES.....	1011199.99
SUM OF SQUARES.....	1082732788.67
MEAN.....	1068.9218
STANDARD ERROR OF THE MEAN	1.4335
STANDARD DEVIATION...	44.0917
VARIANCE.....	1944.0799
THIRD MOMENT.....	-73124.6039
FOURTH MOMENT.....	6820388.8438
SKEWNESS.....	-.853085
KURTOSIS.....	-1.195400
THE MEDIAN VALUE.....	1099.6870
THE MODE VALUE.....	1097.5000
THE MODE FREQUENCY...	576.0000

SYSDEM OUTPUT STATISTICS

FOR

INV LEVL R FILE NUMBER 4
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

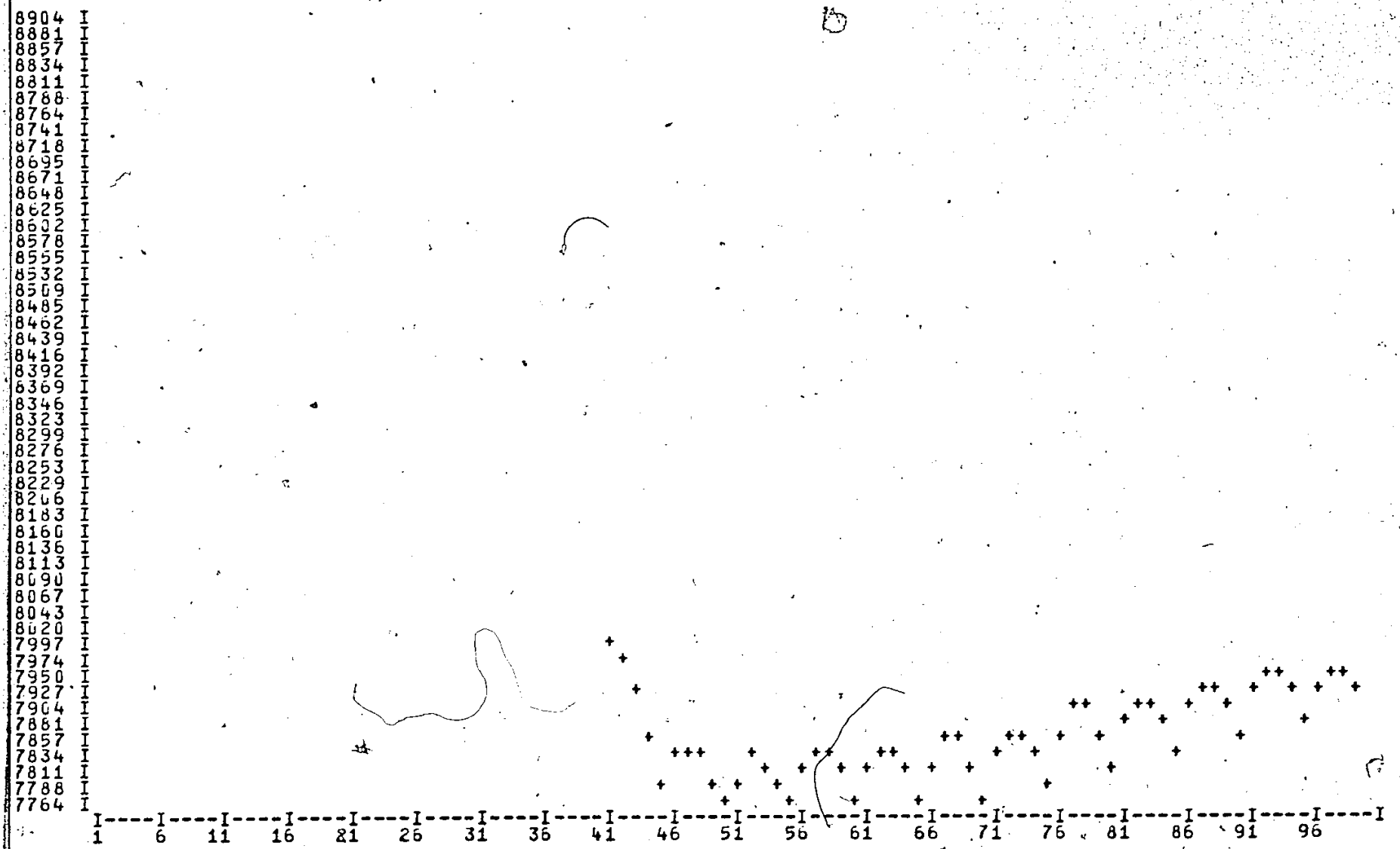
TIME RANGE IS FROM	1 TO 1000
TIME COMPRESSION FACTOR IS ..... THIS IS USED FOR COMPRESSION OF PLOTS ONLY	1
MAXIMUM ACTIVITY CODE ..... IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED	0
PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY.....	VALUE 1
PRINT TABLES.....	NO
PUNCH ON FILE7.....	NO
WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT IF ZERO, NO PLOTS ARE PRINTED.....	11
NO. OF INTERVALS ON THE HISTOGRAM (GROUPS) MAY HAVE UP TO 20 INTERVALS IF ZERO, NO HISTOGRAM PRINTED.....	20
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS	0

FILE NO. 4 INV LEVL R HAS 958 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 998

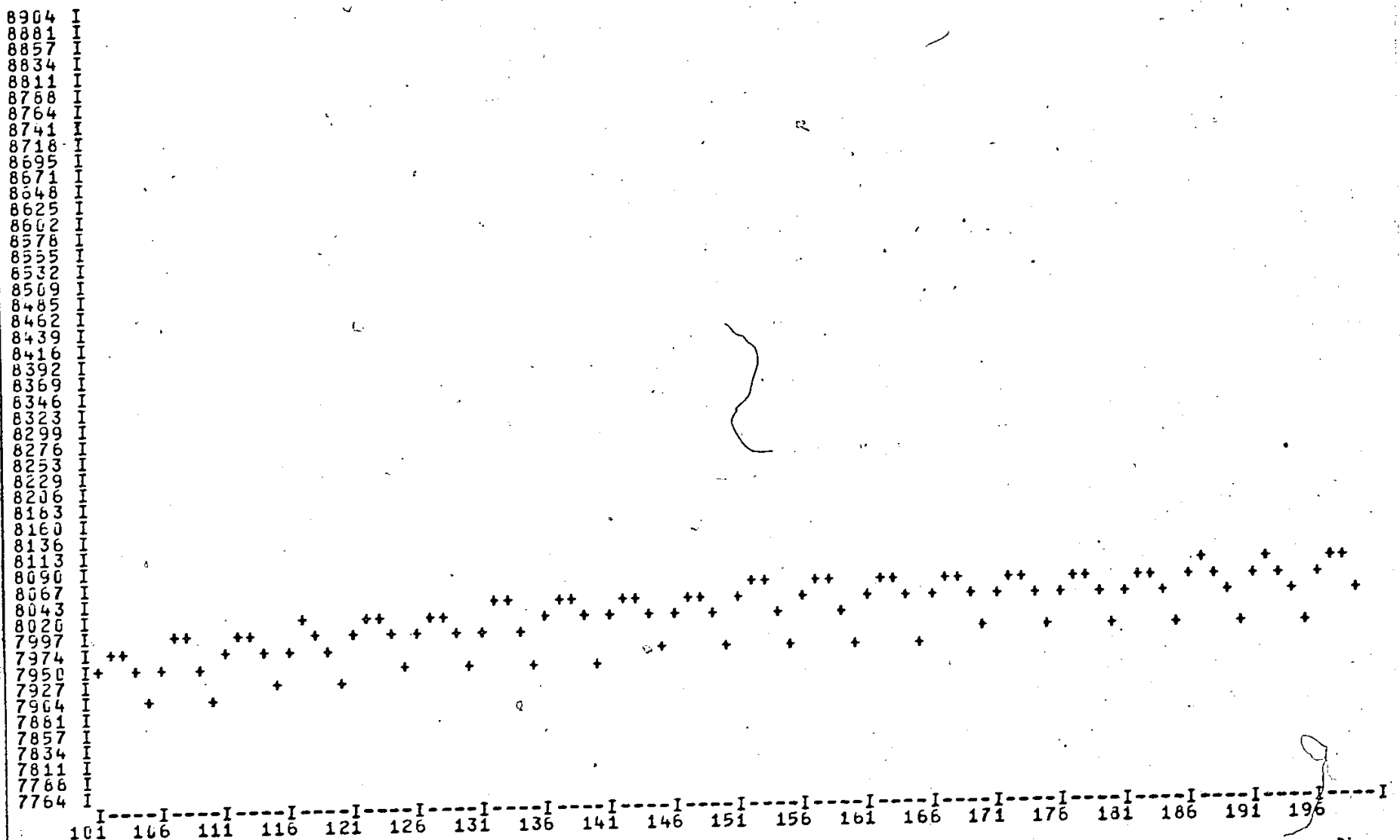
NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



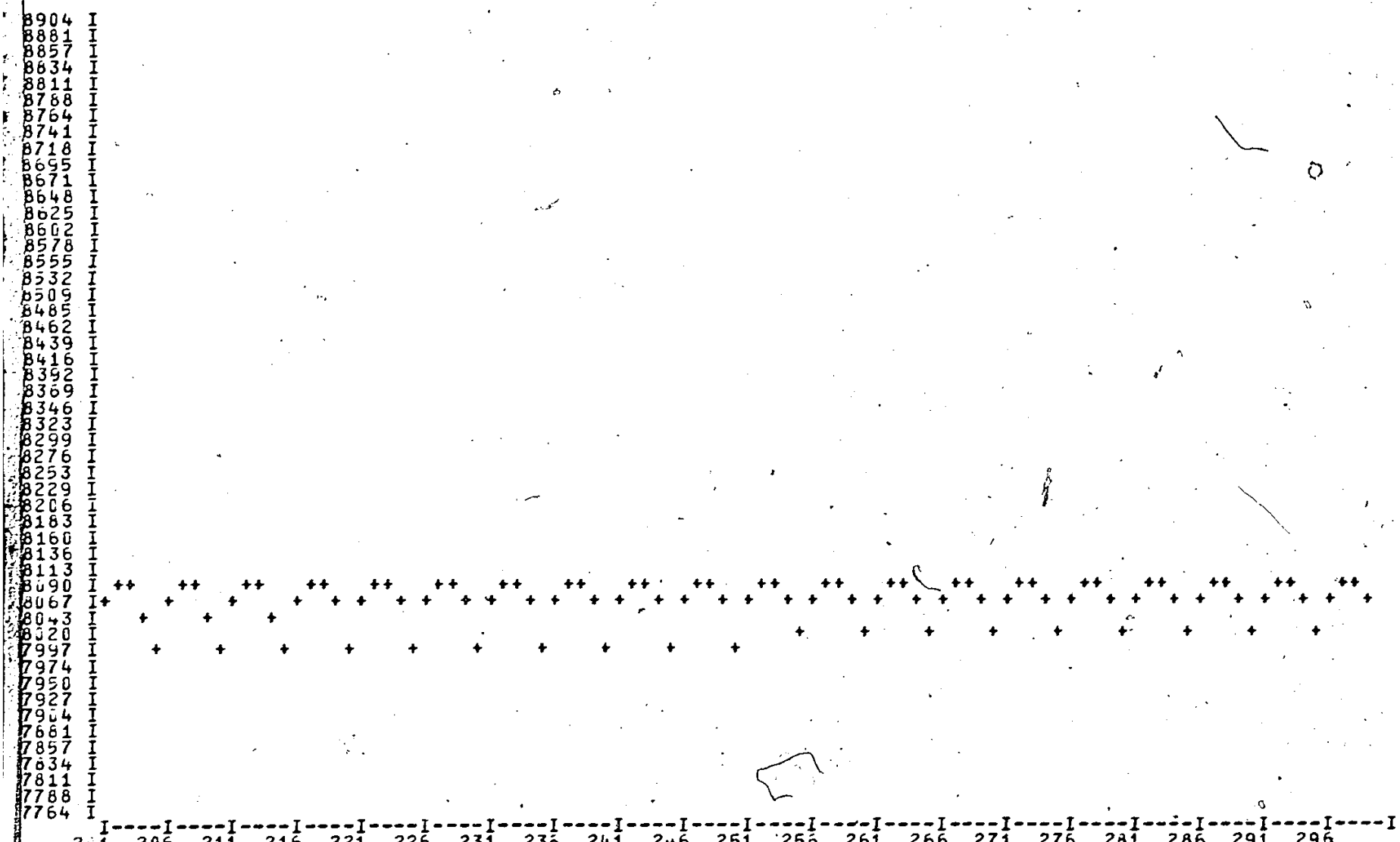
NUMBER OF POINTS PLOTTED 59

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



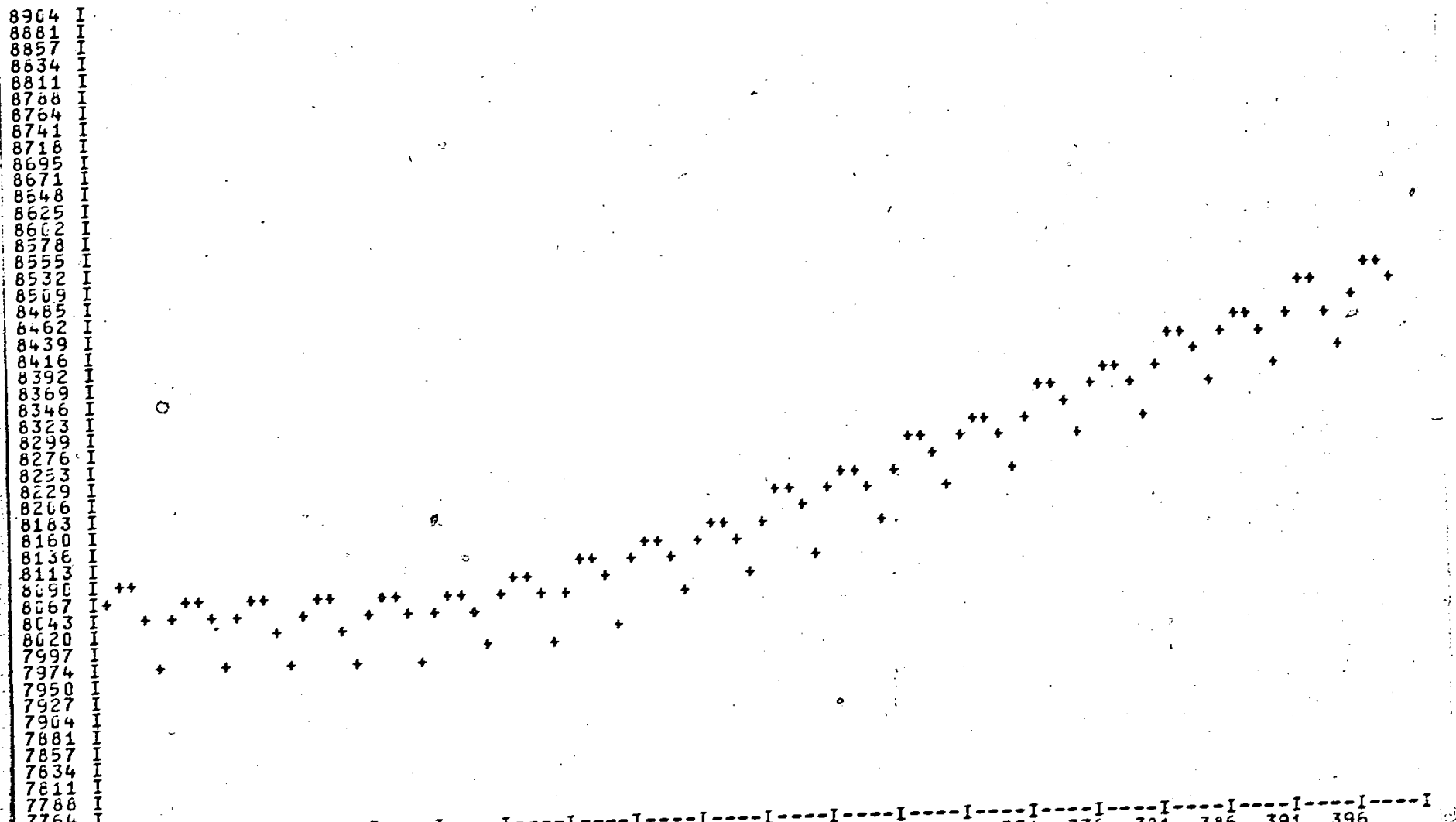
NUMBER OF POINTS PLOTTED 99

CYSJEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



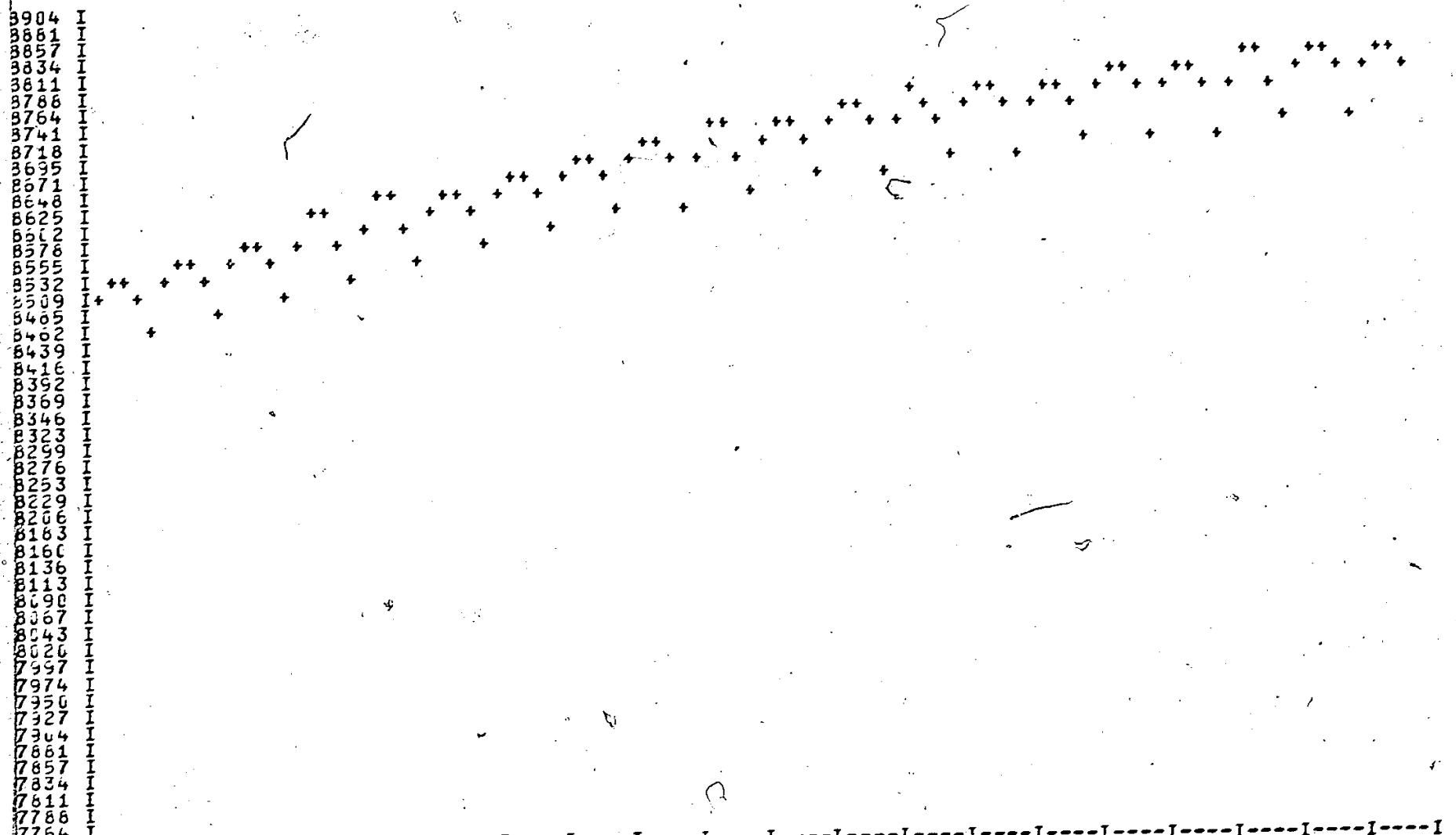
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001

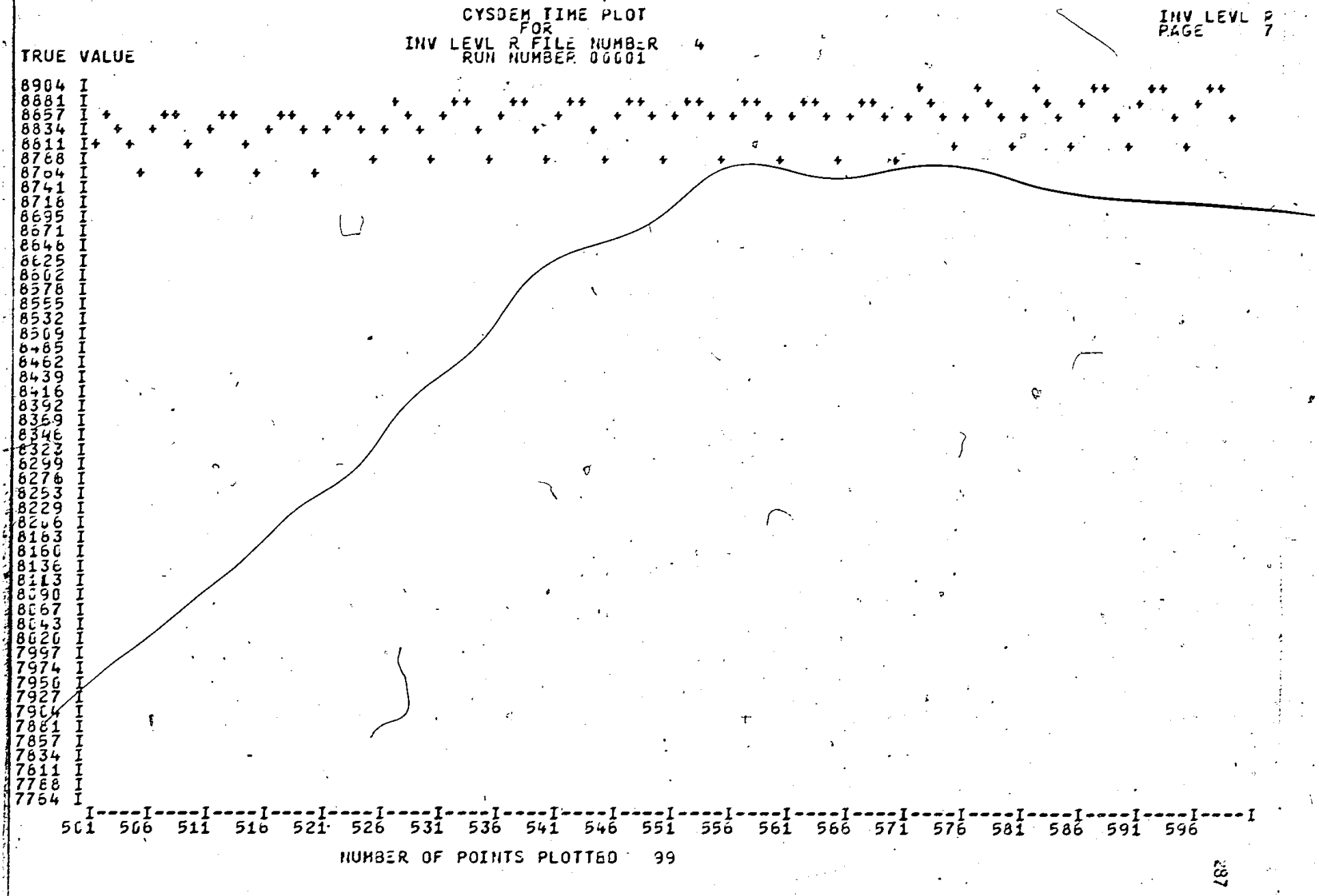


NUMBER OF POINTS PLOTTED: 99

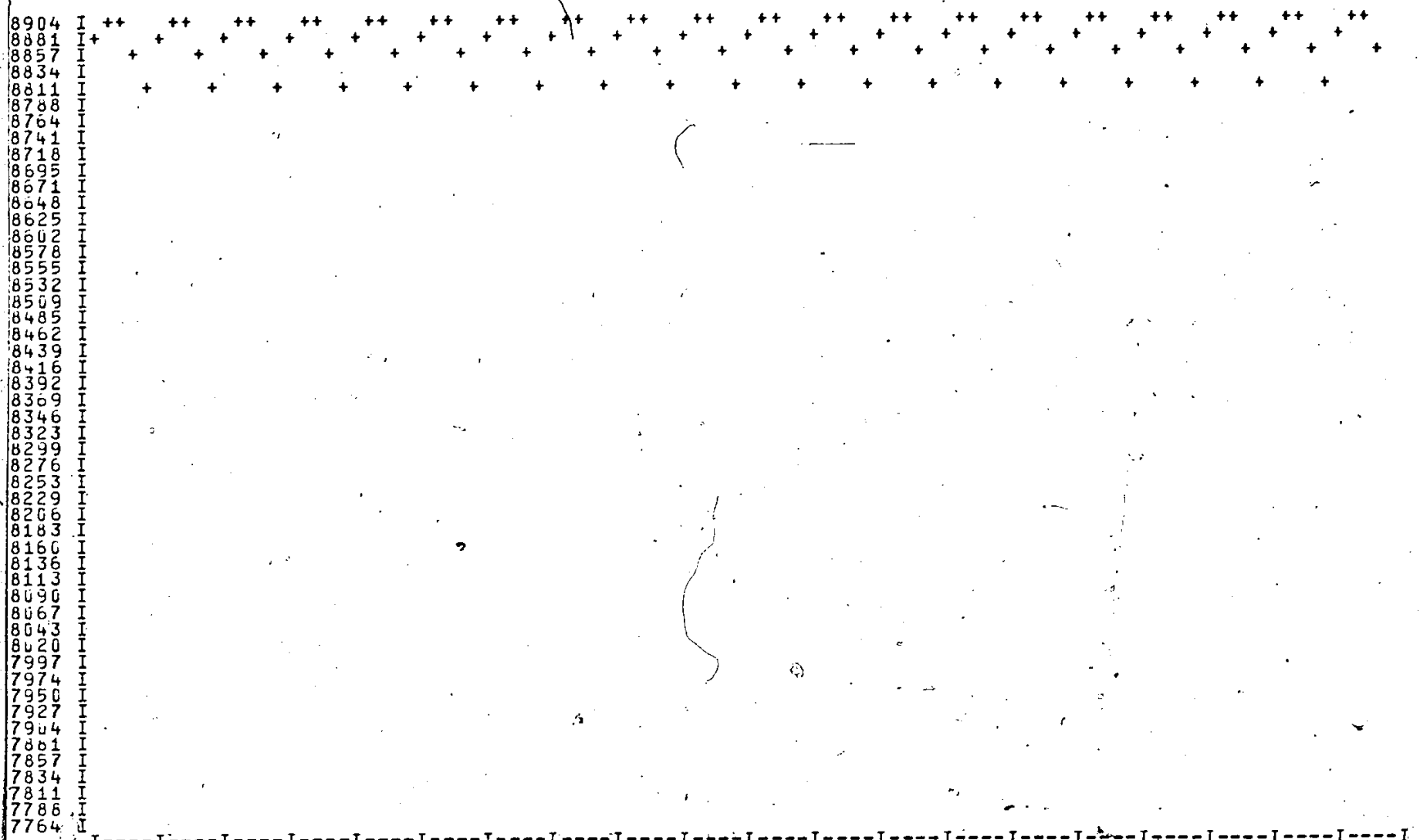
CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

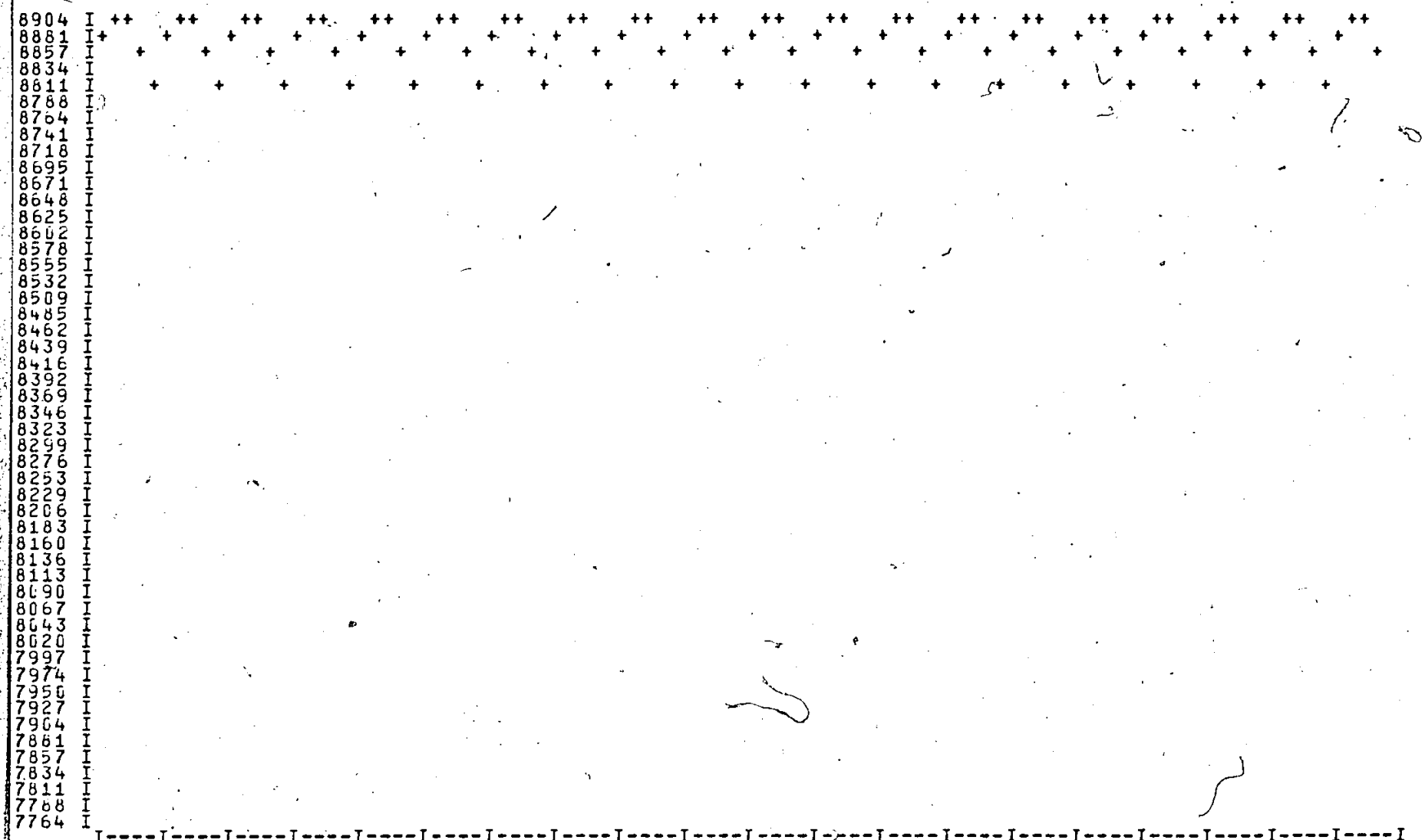

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001
INV LEVL R
PAGE 7
TRUE VALUE
8904
8881
8857
8834
8811
8788
8764
8741
8718
8695
8671
8648
8625
8602
8578
8555
8532
8509
8485
8462
8439
8416
8392
8369
8346
8323
8299
8276
8253
8229
8206
8183
8160
8136
8113
8090
8067
8043
8020
7997
7974
7950
7927
7904
7881
7857
7834
7811
7788
7764
501 506 511 516 521 526 531 536 541 546 551 556 561 566 571 576 581 586 591 596
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



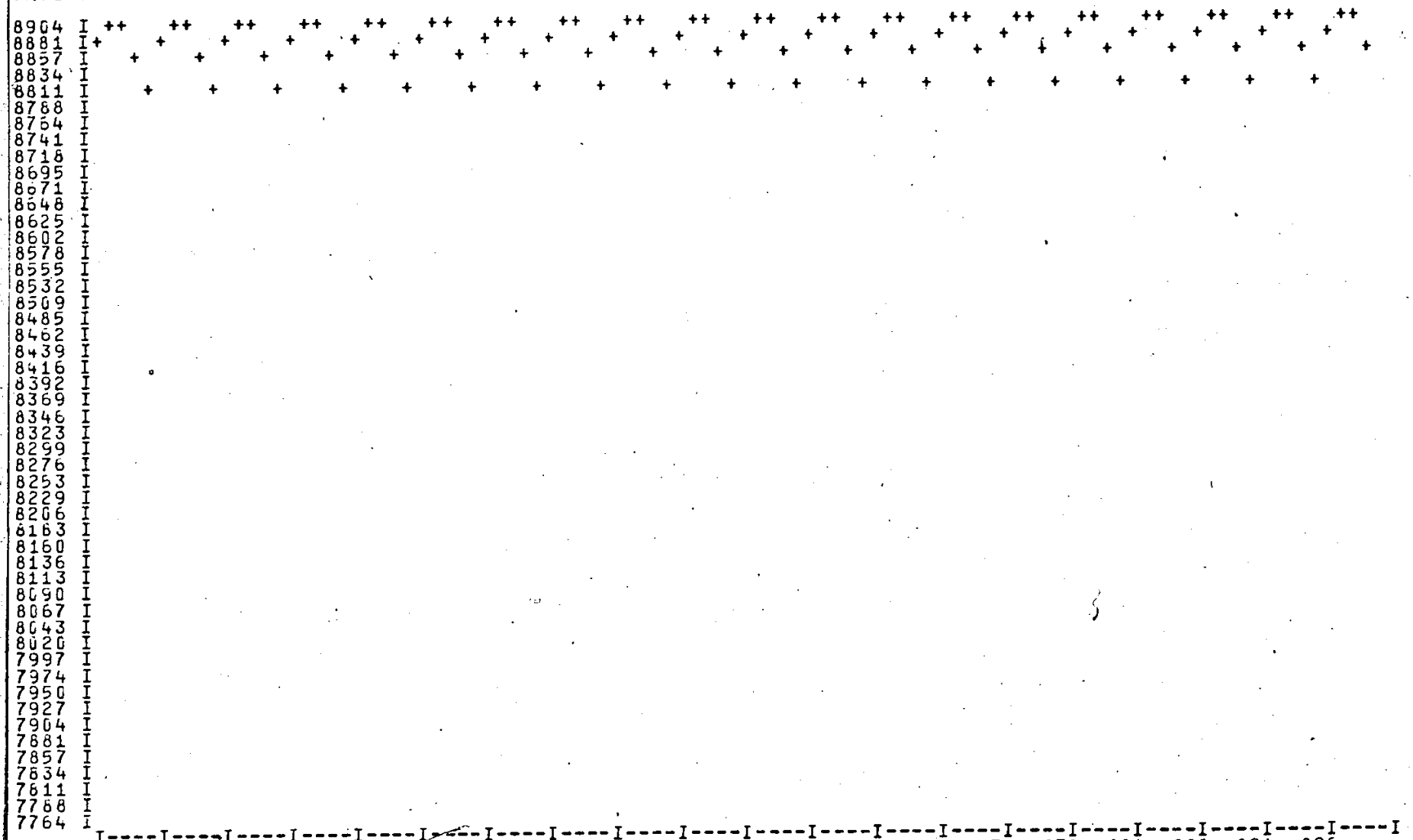
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

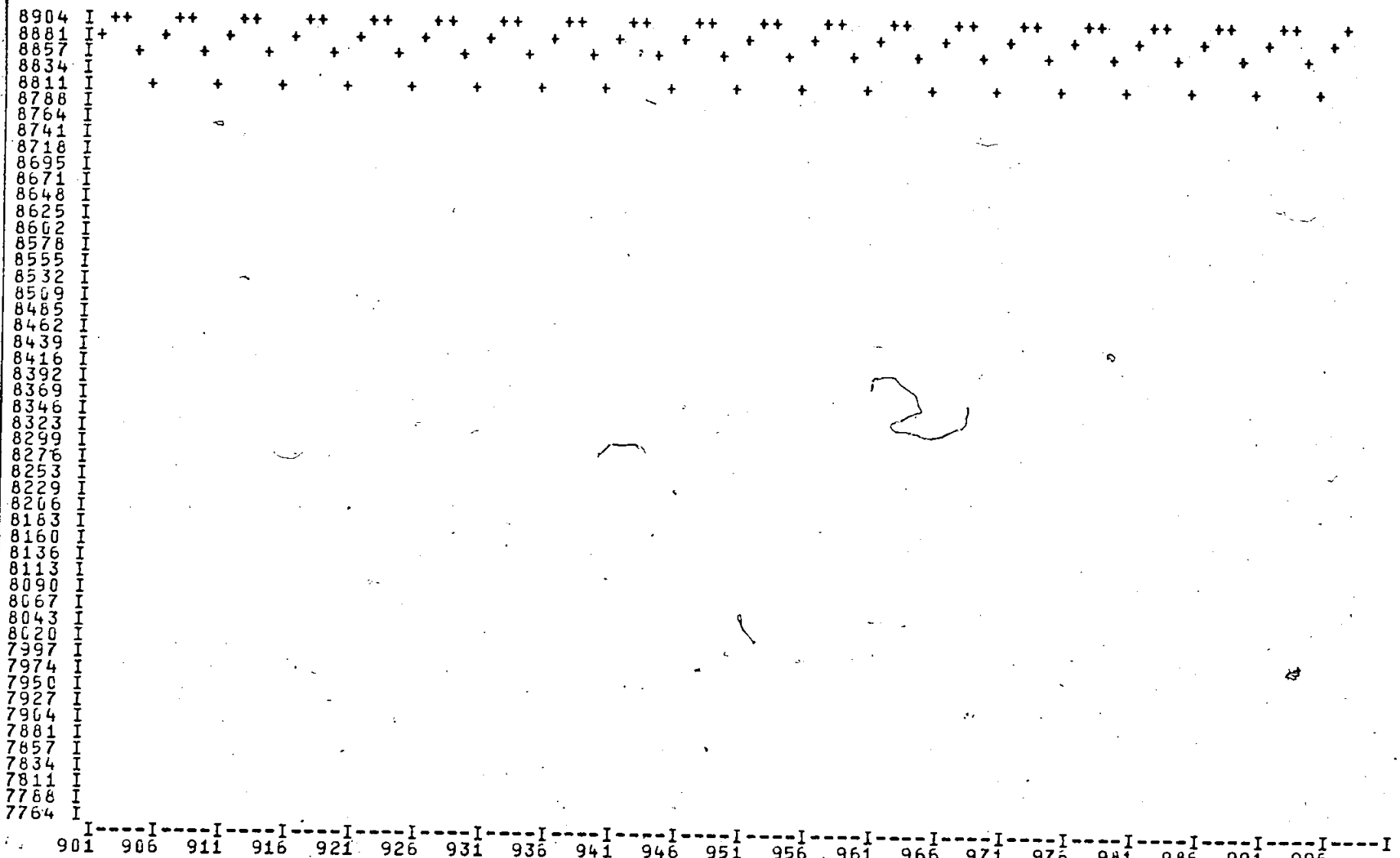
CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED = 99

CYSDEM TIME PLOT
FOR
INV LEVL R FILE NUMBER 4
RUN NUMBER 00001

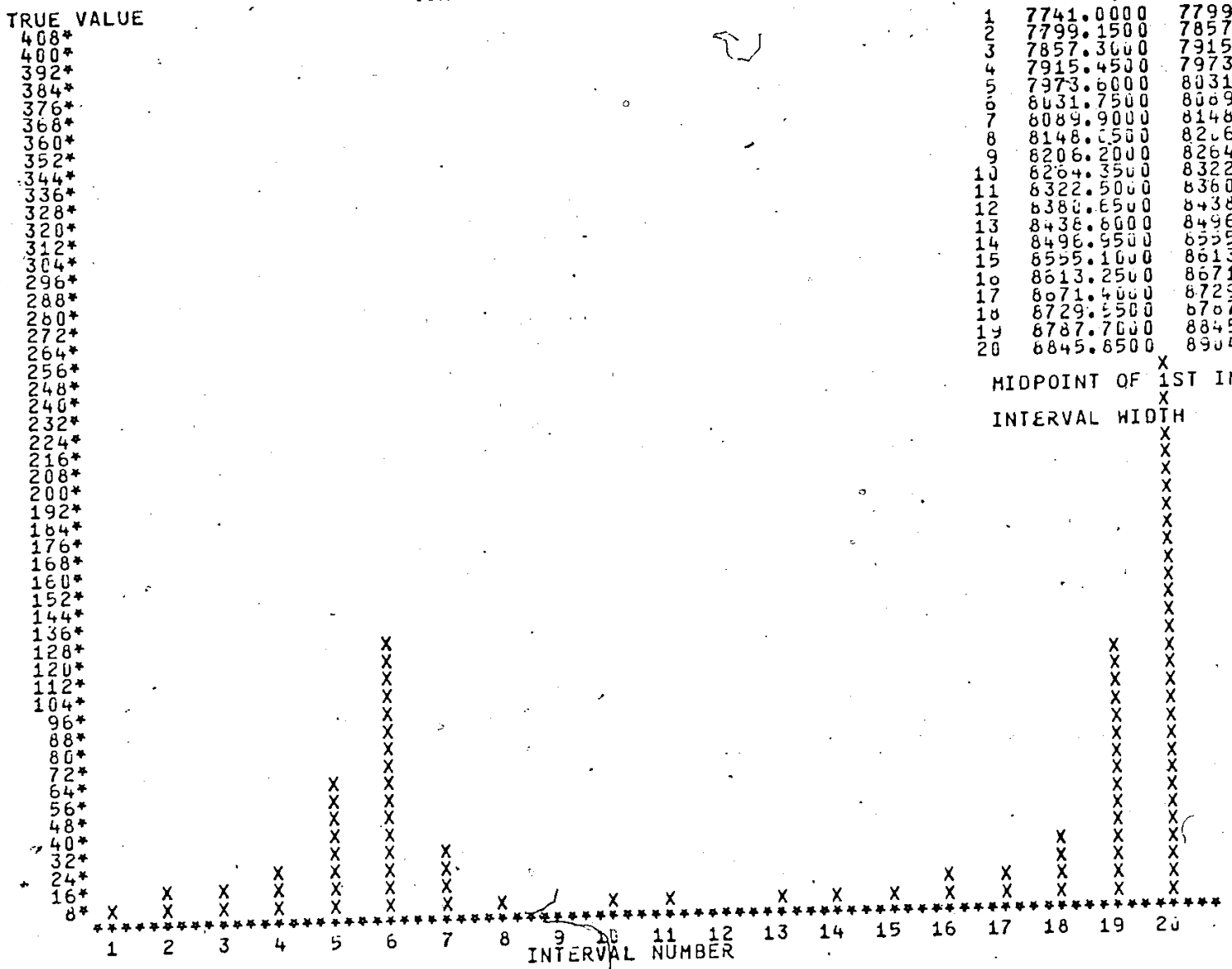
TRUE VALUE



NUMBER OF POINTS PLOTTED 97

C Y S O E M
HISTOGRAM AND STATISTICS

INV LEVL R FILE NUMBER 4
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENCY
1	7741.0000	7799.1500	11
2	7799.1500	7857.3000	21
3	7857.3000	7915.4500	17
4	7915.4500	7973.6000	26
5	7973.6000	8031.7500	69
6	8031.7500	8089.9000	128
7	8089.9000	8148.0500	37
8	8148.0500	8206.2000	9
9	8206.2000	8264.3500	6
10	8264.3500	8322.5000	10
11	8322.5000	8380.6500	9
12	8380.6500	8438.8000	7
13	8438.8000	8496.9500	10
14	8496.9500	8555.1000	11
15	8555.1000	8613.2500	12
16	8613.2500	8671.4000	16
17	8671.4000	8729.5500	18
18	8729.5500	8787.7000	32
19	8787.7000	8845.8500	126
20	8845.8500	8904.0000	383

MIDPOINT OF 1ST INTERVAL 7770.0750

INTERVAL WIDTH 58.1500

292

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

INV LEVL R FILE NUMBER 4
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	958
MINIMUM SCORE.....	7741.0000
MAXIMUM SCORE.....	8904.0000
RANGE.....	1163.0000
SUM OF SCORES.....	8183665.00
SUM OF SQUARES.....	70058127743.00
MEAN.....	8542.4478
STANDARD ERROR OF THE MEAN	12.7672
STANDARD DEVIATION...	395.1647
VARIANCE.....	156155.1176
THIRD MOMENT.....	-35396601.8203
FOURTH MOMENT.....37774380928.0000	
SKEWNESS.....	-.573656
KURTOSIS.....	-1.450881
THE MEDIAN VALUE.....	8809.0000
THE MODE VALUE.....	8874.9250
THE MODE FREQUENCY...	383.0000

SYSDEM OUTPUT STATISTICS

FOR

UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

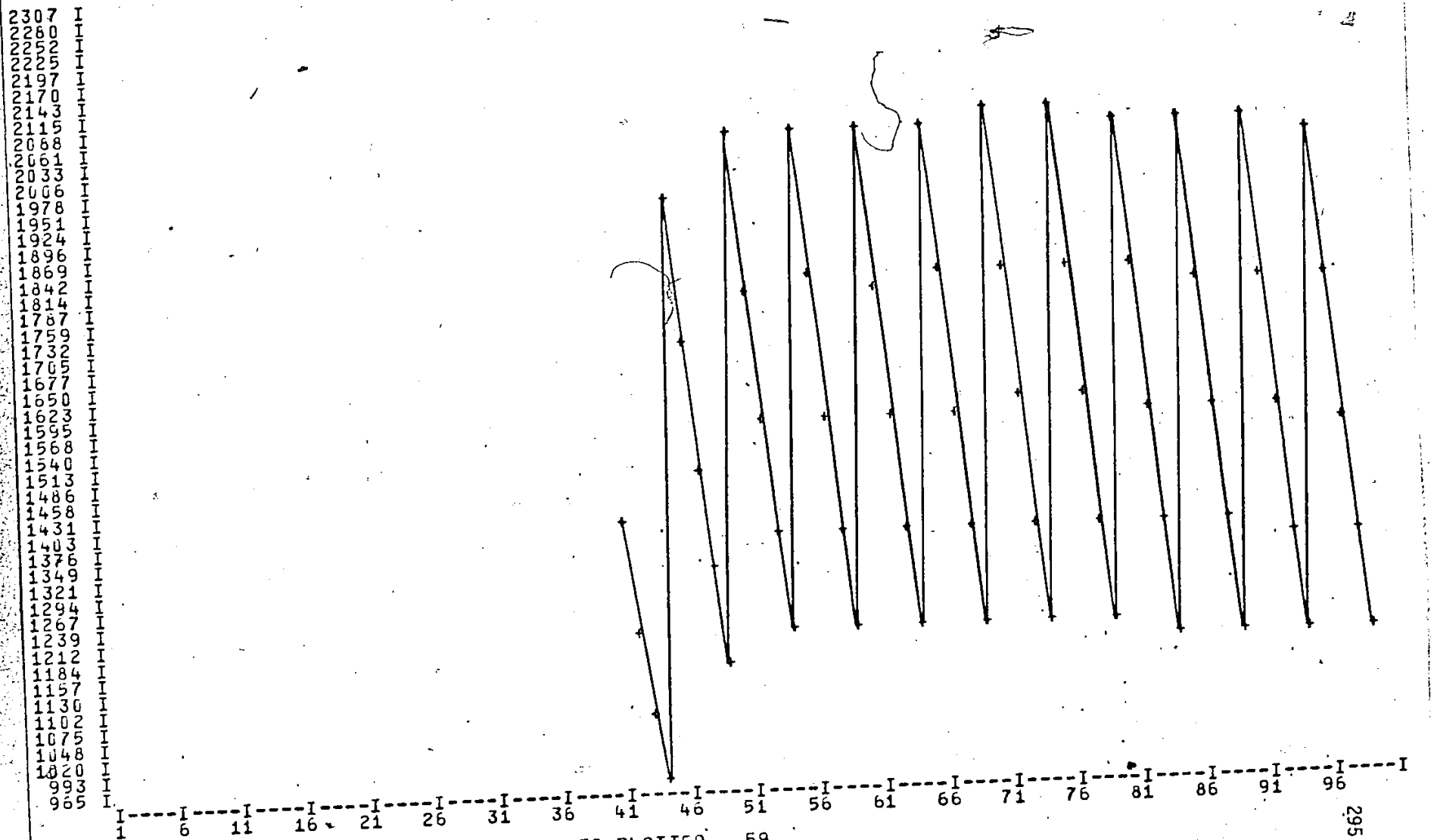
TIME RANGE IS FROM	1 TO 1000
TIME COMPRESSION FACTOR IS THIS IS USED FOR COMPRESSION OF PLOTS ONLY	1
MAXIMUM ACTIVITY CODE IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED	0
PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY	VALUE 1
PRINT TABLES	NO
PUNCH ON FILE7	NO
WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT IF ZERO, NO PLOTS ARE PRINTED	11
NO. OF INTERVALS ON THE HISTOGRAM (GROUPS) MAY HAVE UP TO 20 INTERVALS IF ZERO, NO HISTOGRAM PRINTED	20
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS	0

FILE NO. 5 UNFLLDORDD HAS 958 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 998

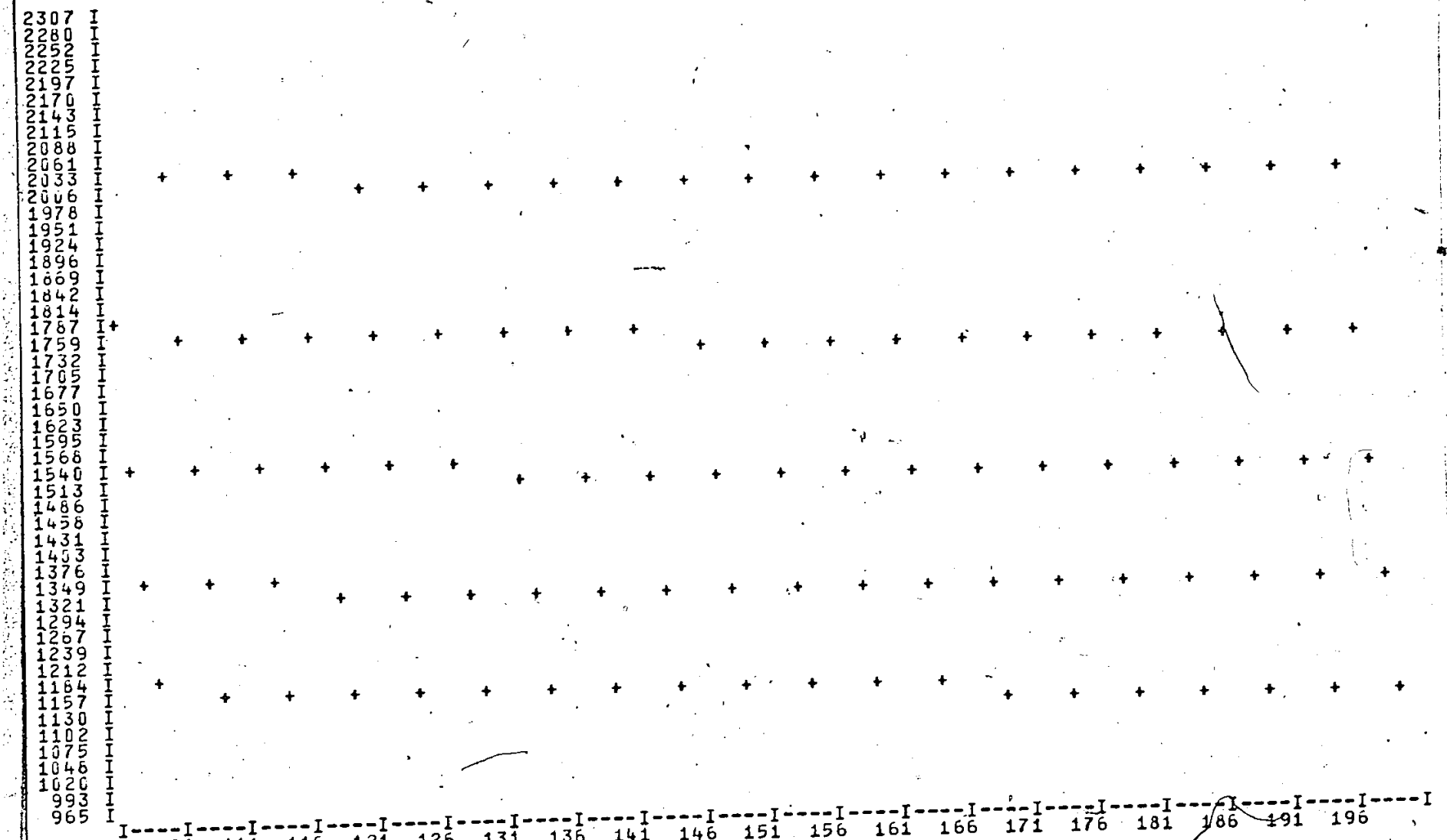
NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



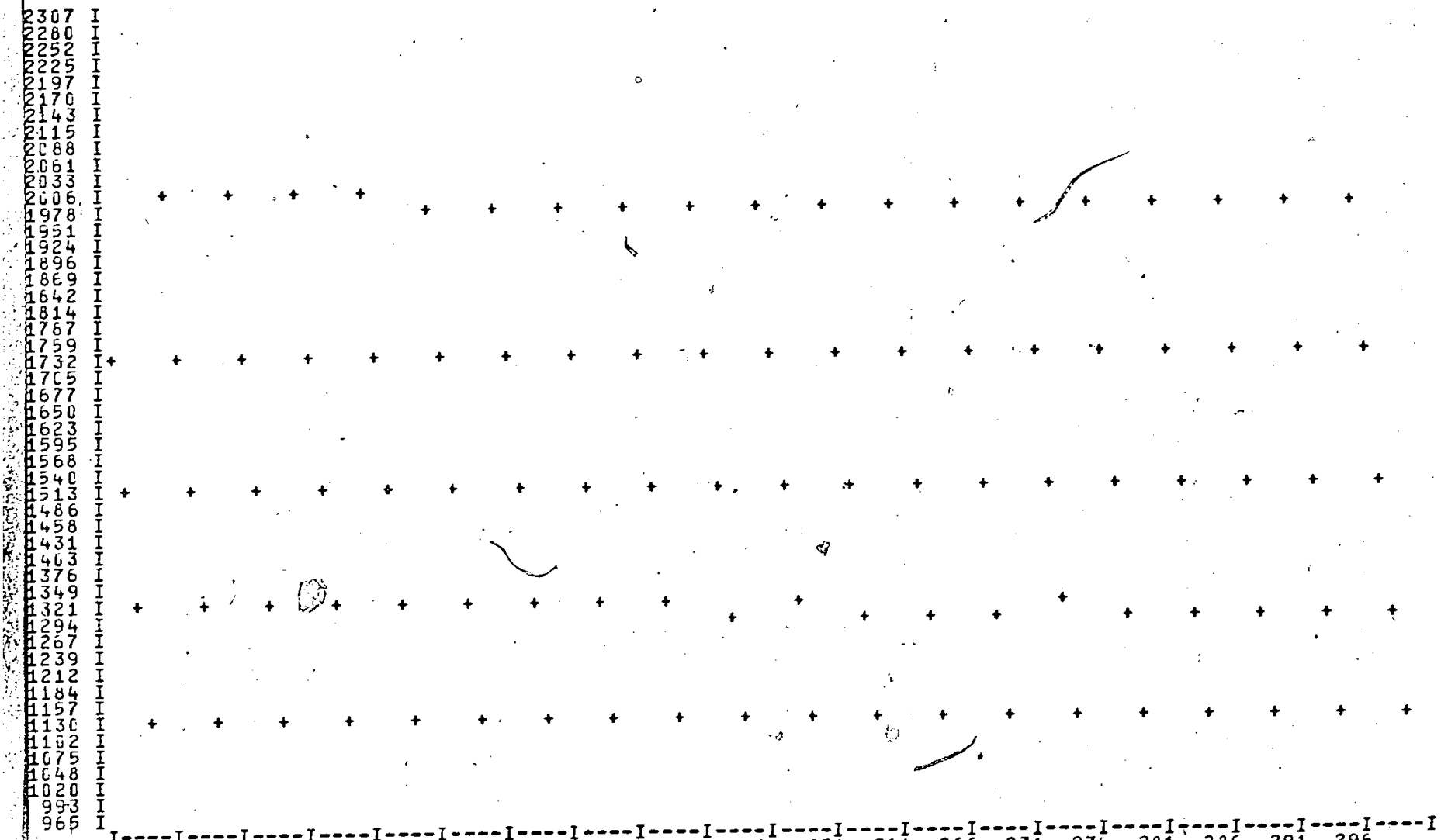
NUMBER OF POINTS PLOTTED 59

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 0.001



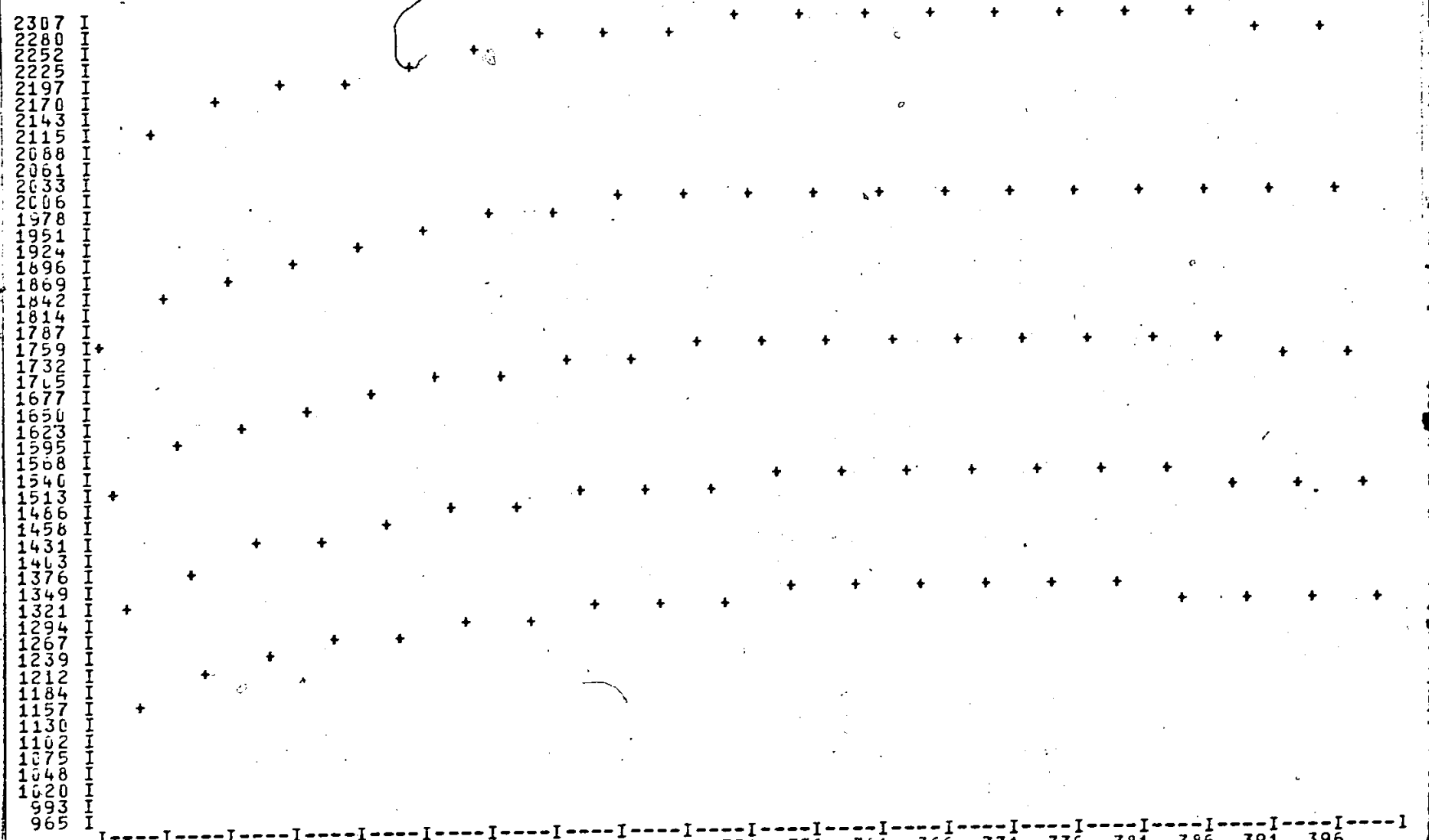
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFL.DORDD FILE NUMBER 5
RUN NUMBER 00001



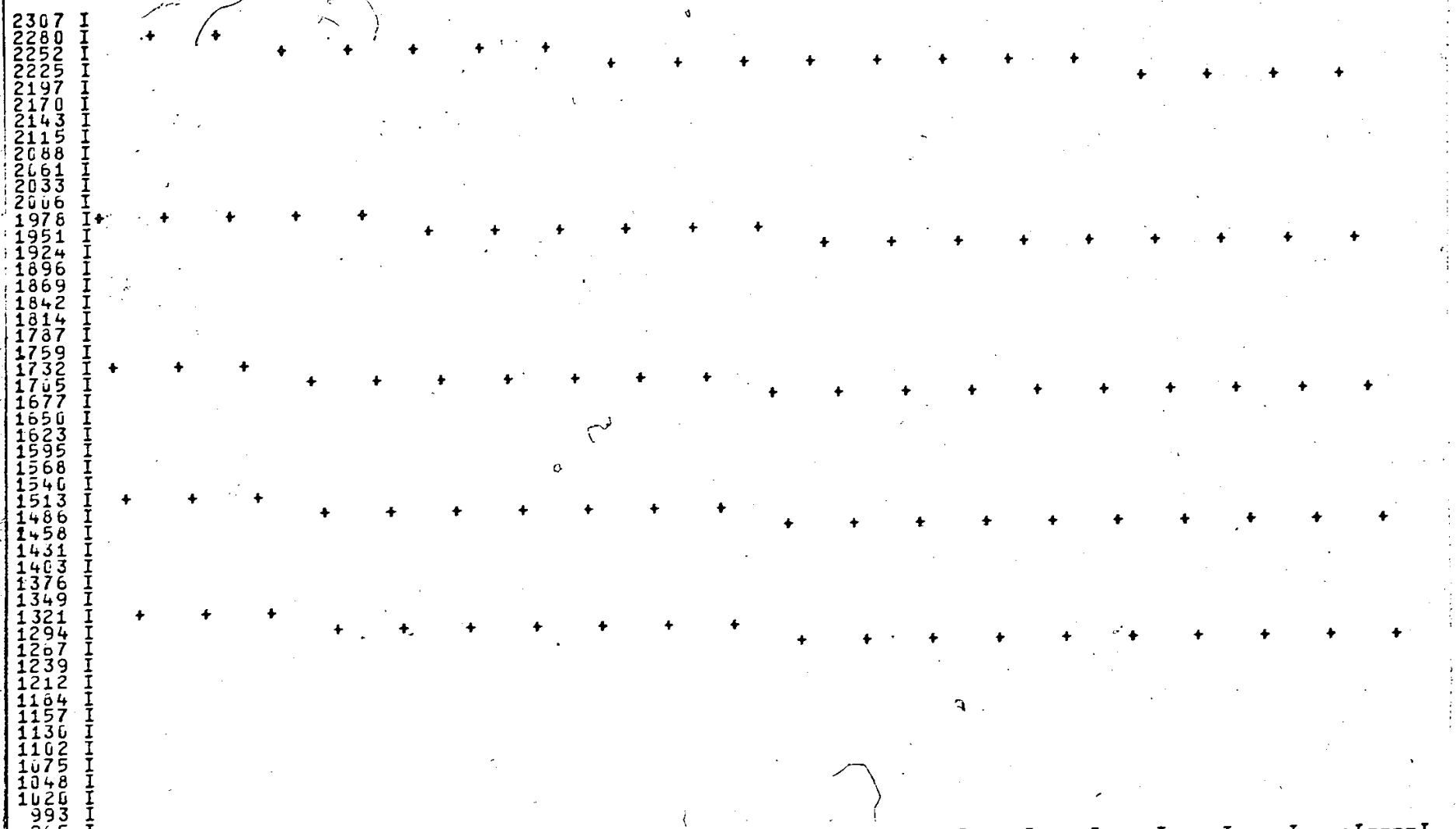
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



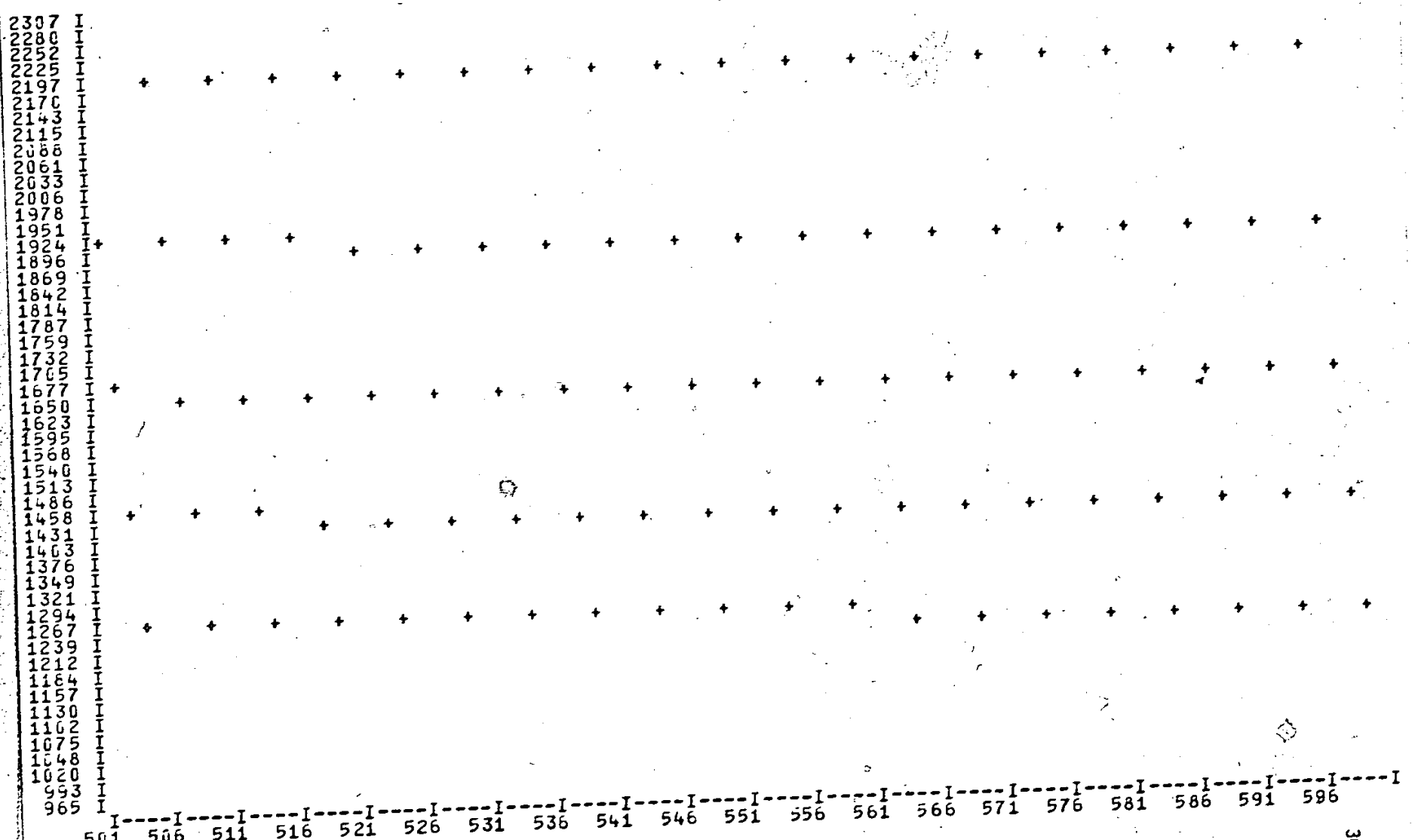
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLOORDD FILE NUMBER 5
RUN NUMBER 00001



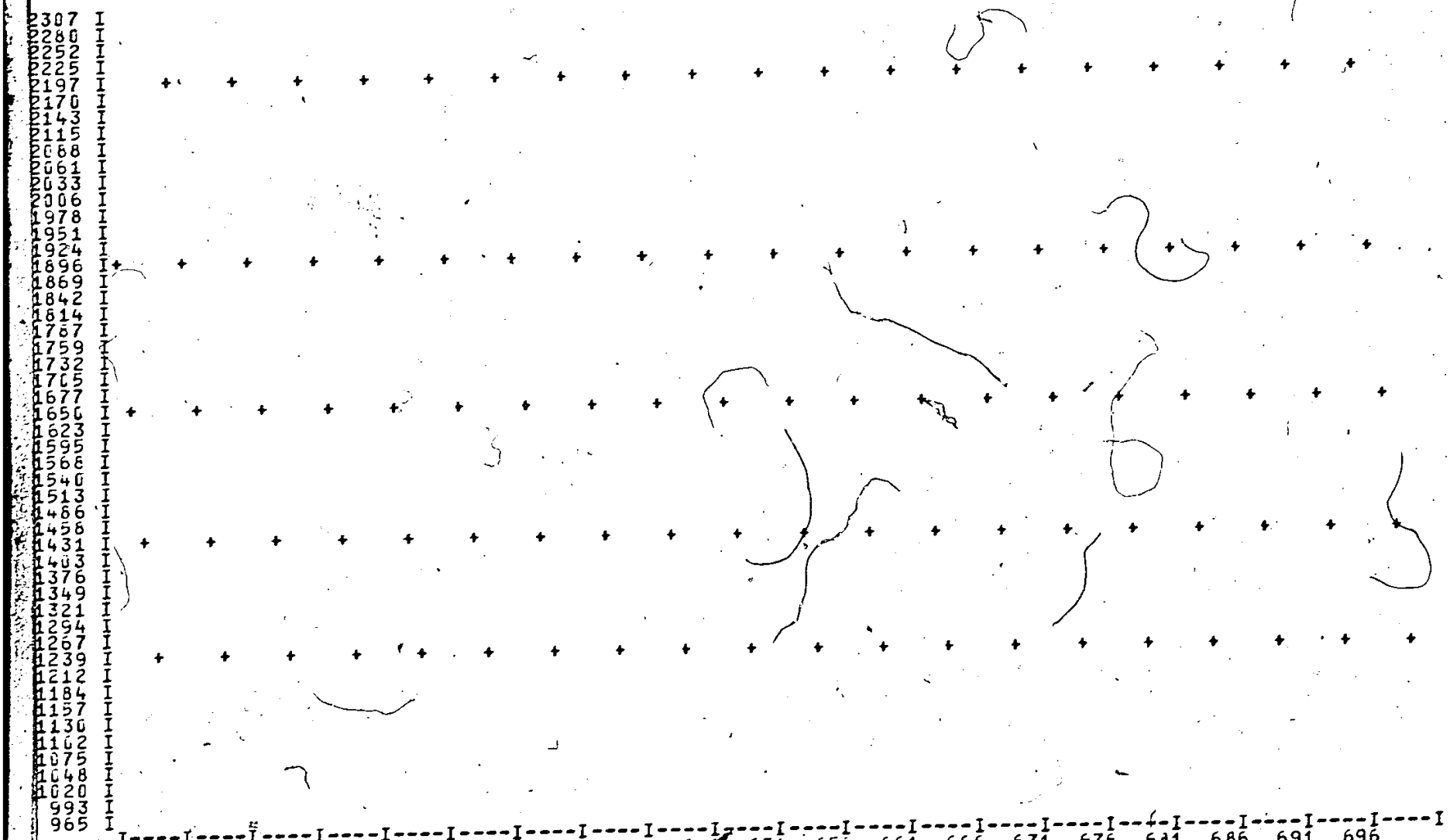
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDO FILE NUMBER 5
RUN NUMBER 00001



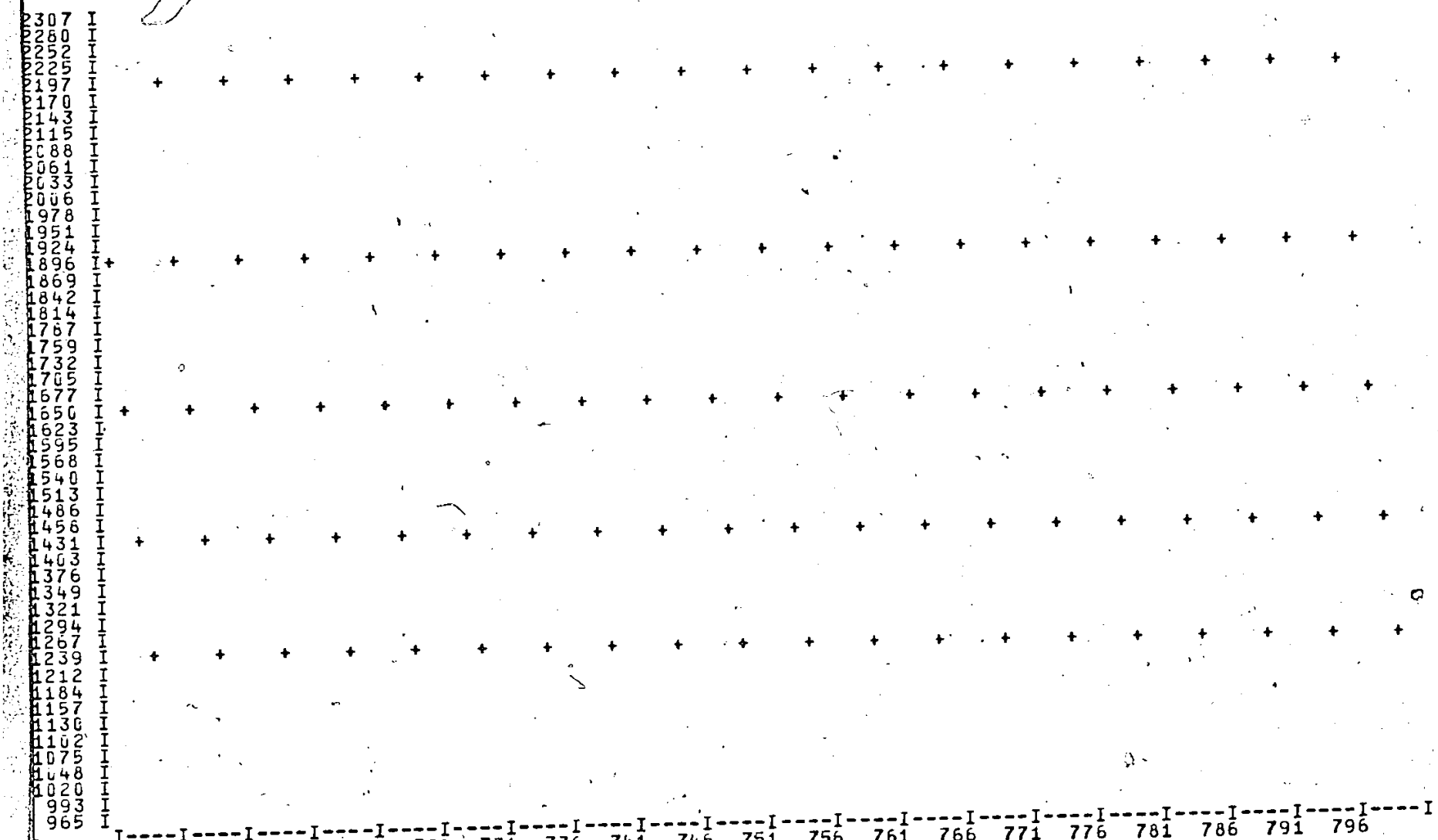
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



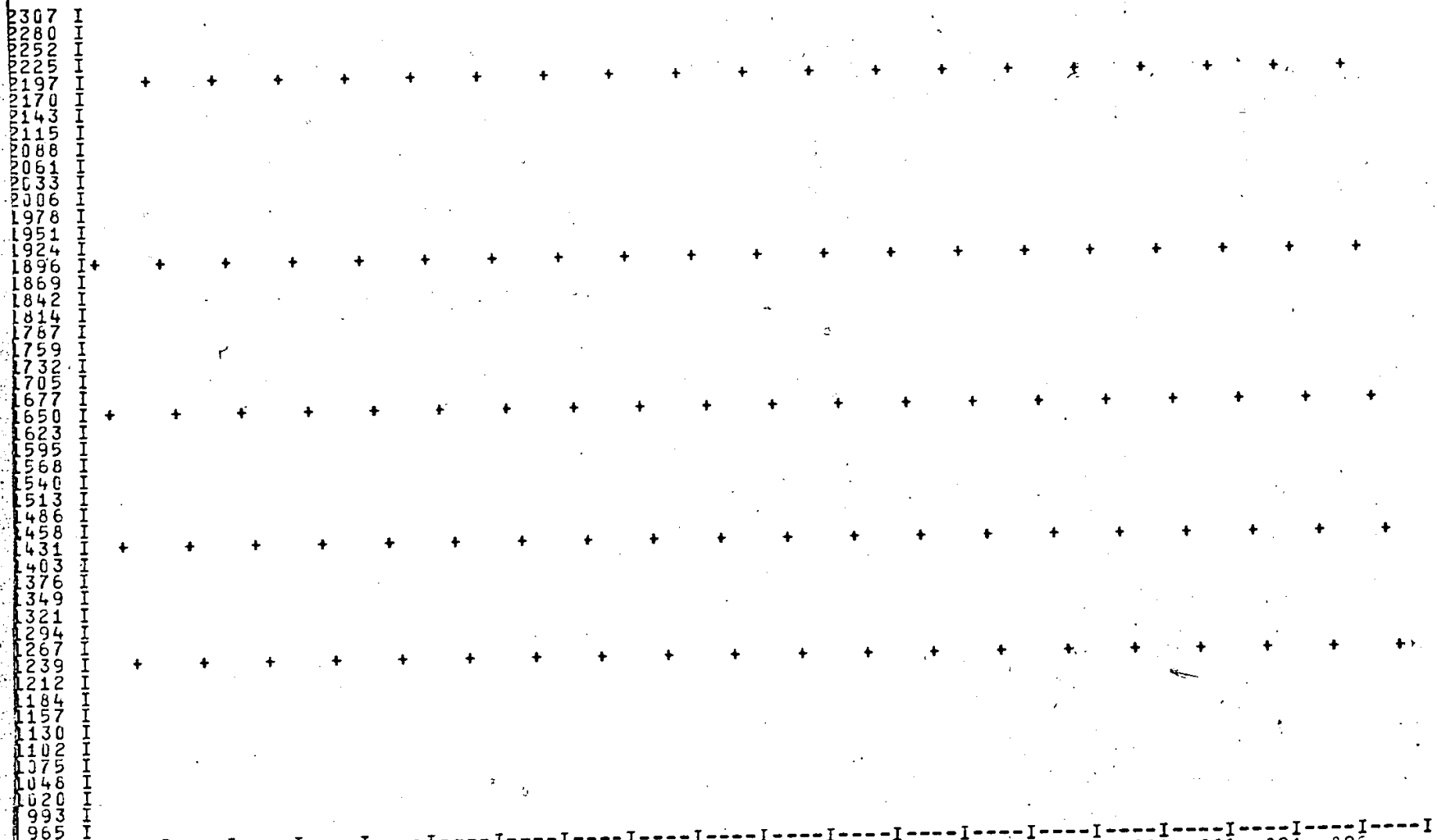
NUMBER OF POINTS PLOTTED 39

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



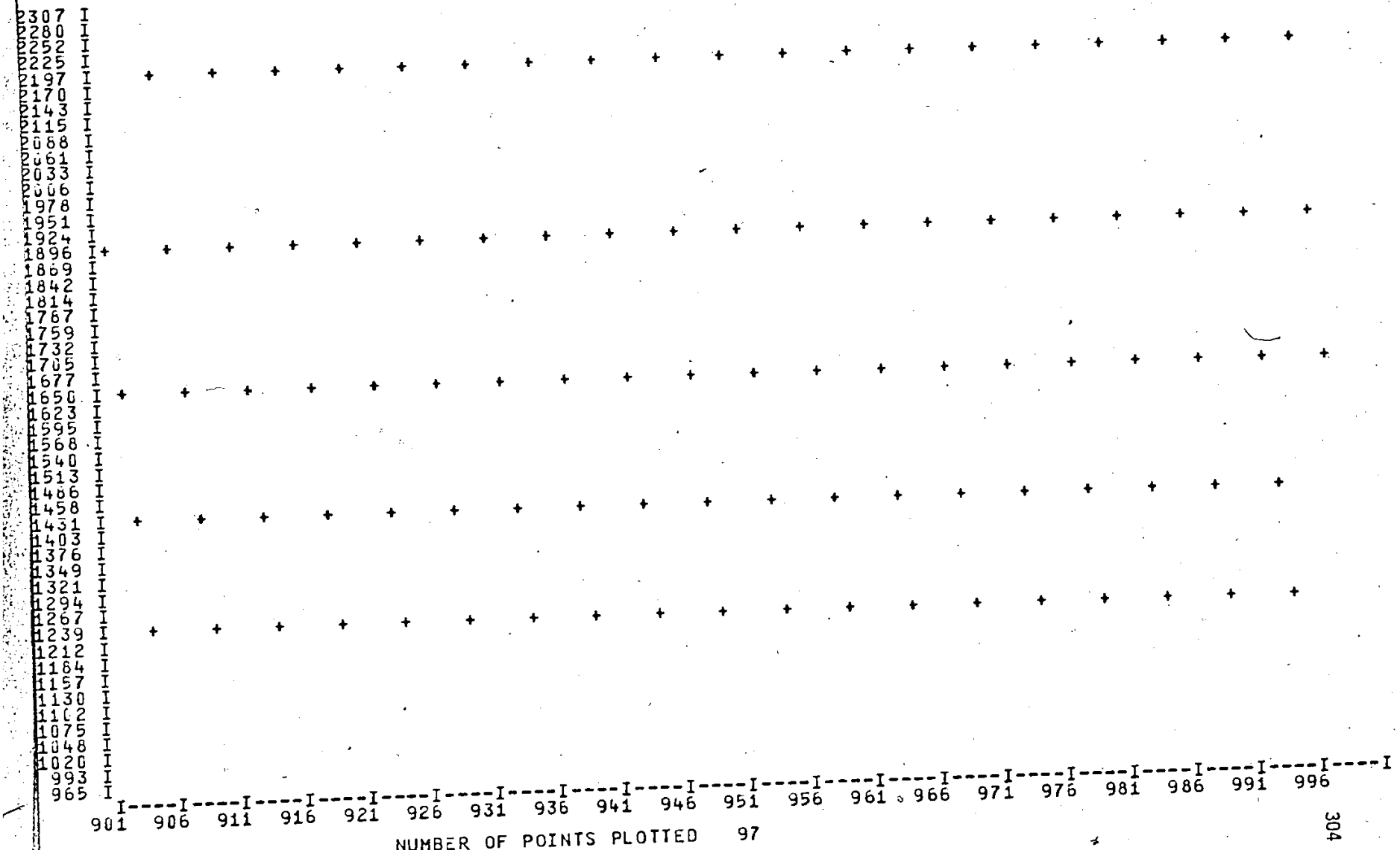
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

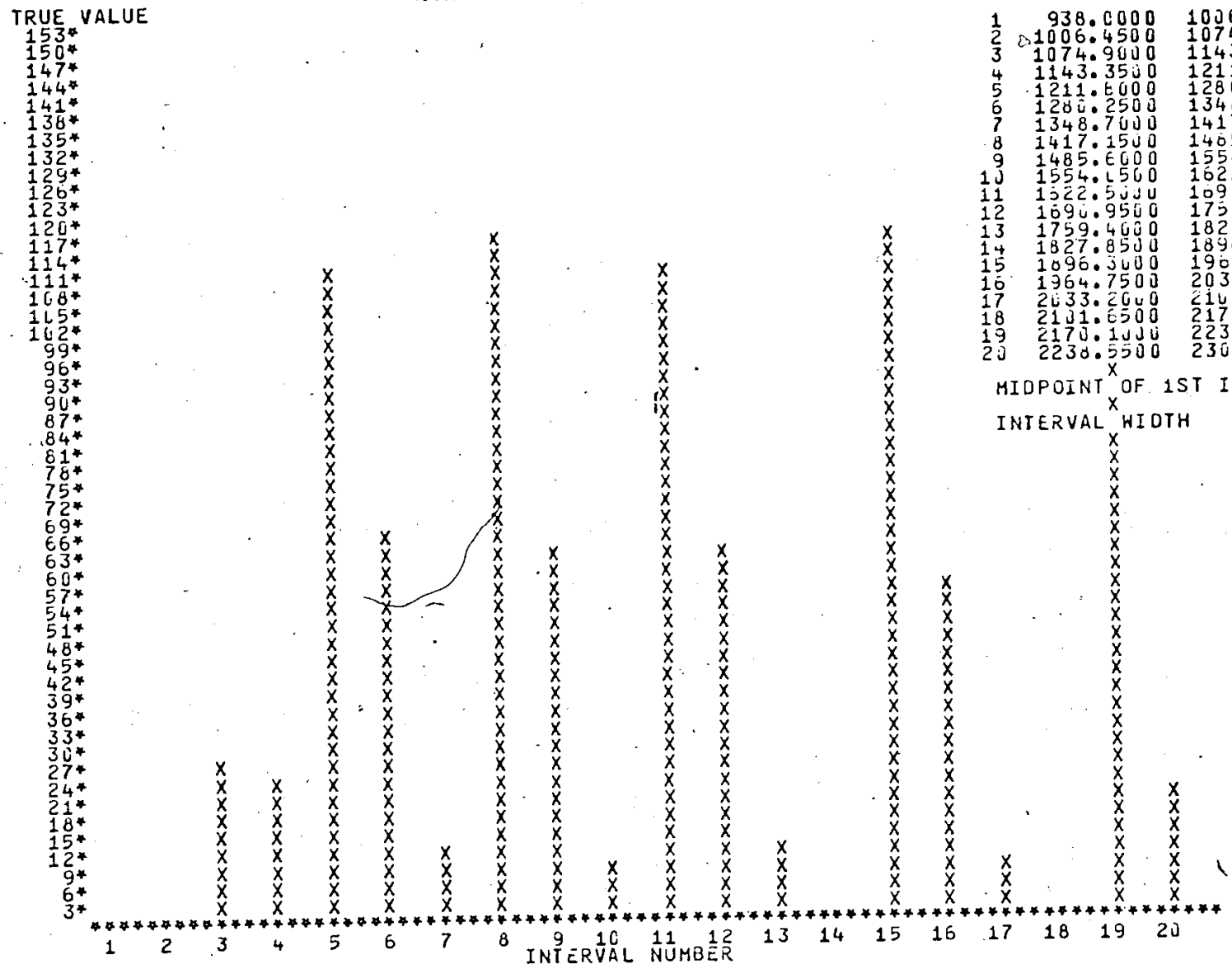
CYSDEM TIME PLOT
FOR
UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 97

C Y S D E M
HISTOGRAM AND STATISTICS

UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	938.0000	1006.4500	1
2	1006.4500	1074.9000	1
3	1074.9000	1143.3500	27
4	1143.3500	1211.8000	26
5	1211.8000	1280.2500	113
6	1280.2500	1348.7000	66
7	1348.7000	1417.1500	13
8	1417.1500	1485.6000	118
9	1485.6000	1554.0500	63
10	1554.0500	1622.5000	10
11	1622.5000	1690.9500	113
12	1690.9500	1759.4000	63
13	1759.4000	1827.8500	14
14	1827.8500	1896.3000	2
15	1896.3000	1964.7500	119
16	1964.7500	2033.2000	59
17	2033.2000	2101.6500	11
18	2101.6500	2170.1000	2
19	2170.1000	2238.5500	115
20	2238.5500	2307.0000	22

MIDPOINT OF 1ST INTERVAL 972.2250

INTERVAL WIDTH 68.4500

DESCRIPTIVE STATISTICS
FOR

UNFLLDORDD FILE NUMBER 5
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	958
MINIMUM SCORE.....	938.0000
MAXIMUM SCORE.....	2307.0000
RANGE.....	1369.0000
SUM OF SCORES.....	1590437.00
SUM OF SQUARES.....	2747512855.00
MEAN.....	1660.1639
STANDARD ERROR OF THE MEAN	10.8040
STANDARD DEVIATION...	334.4000
VARIANCE.....	111823.3708
THIRD MOMENT.....	8623308.8697
FOURTH MOMENT.....23473366301.0000	
SKEWNESS.....	.230608
KURTOSIS.....	-1.122801
THE MEDIAN VALUE.....	1655.0000
THE MODE VALUE.....	1930.5250
THE MODE FREQUENCY...	119.0000

CYSDEM OUTPUT STATISTICS

FOR

WKLY DMNDD FILE NUMBER 6
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 10
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

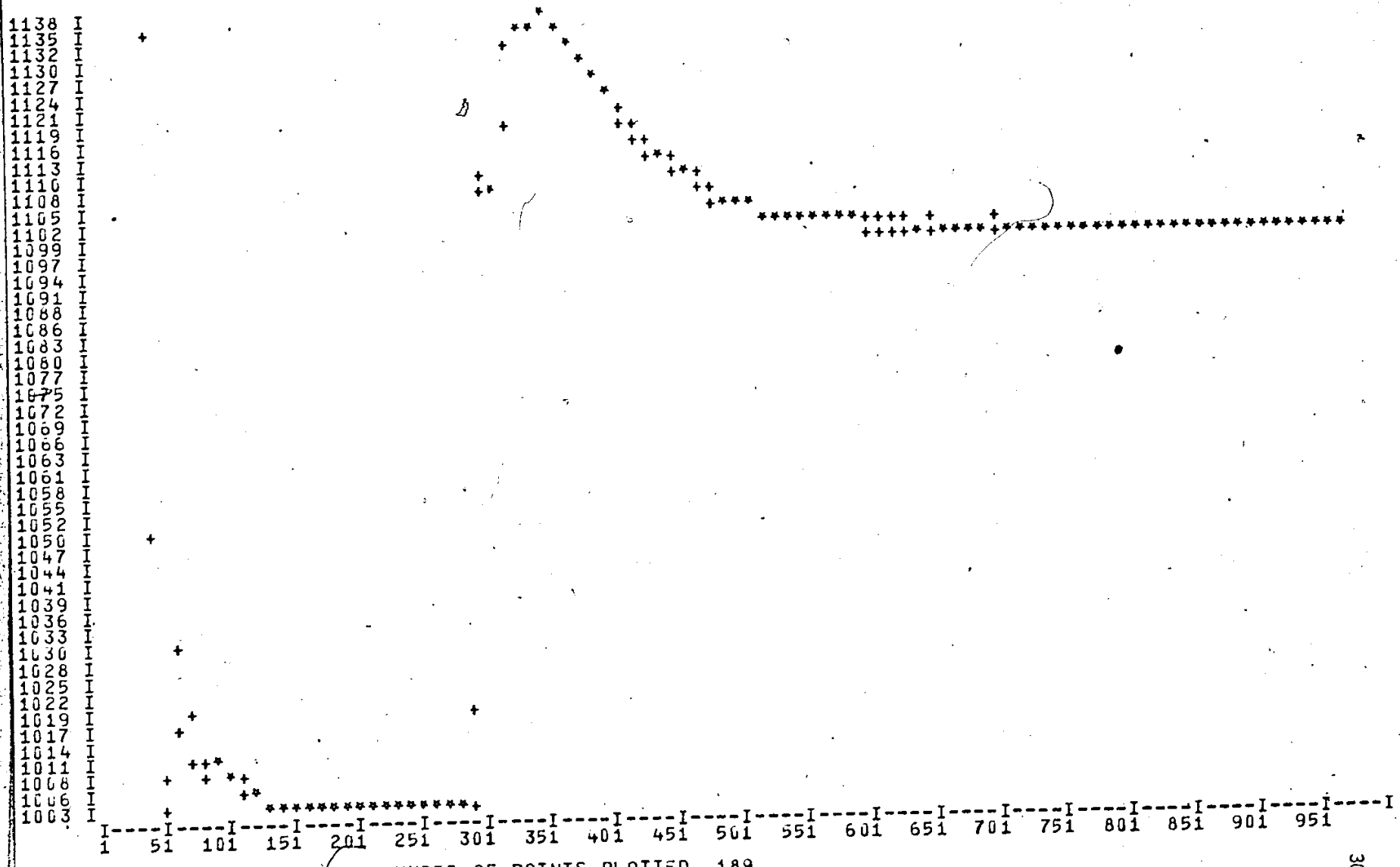
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 6 WKLY DMNDD HAS 190 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 990

NUMBER OF PERIODS FOR VALUE2 = 44

CYSDEM TIME PLOT
FOR
WKLY DMNDD FILE NUMBER 6
RUN NUMBER 00001

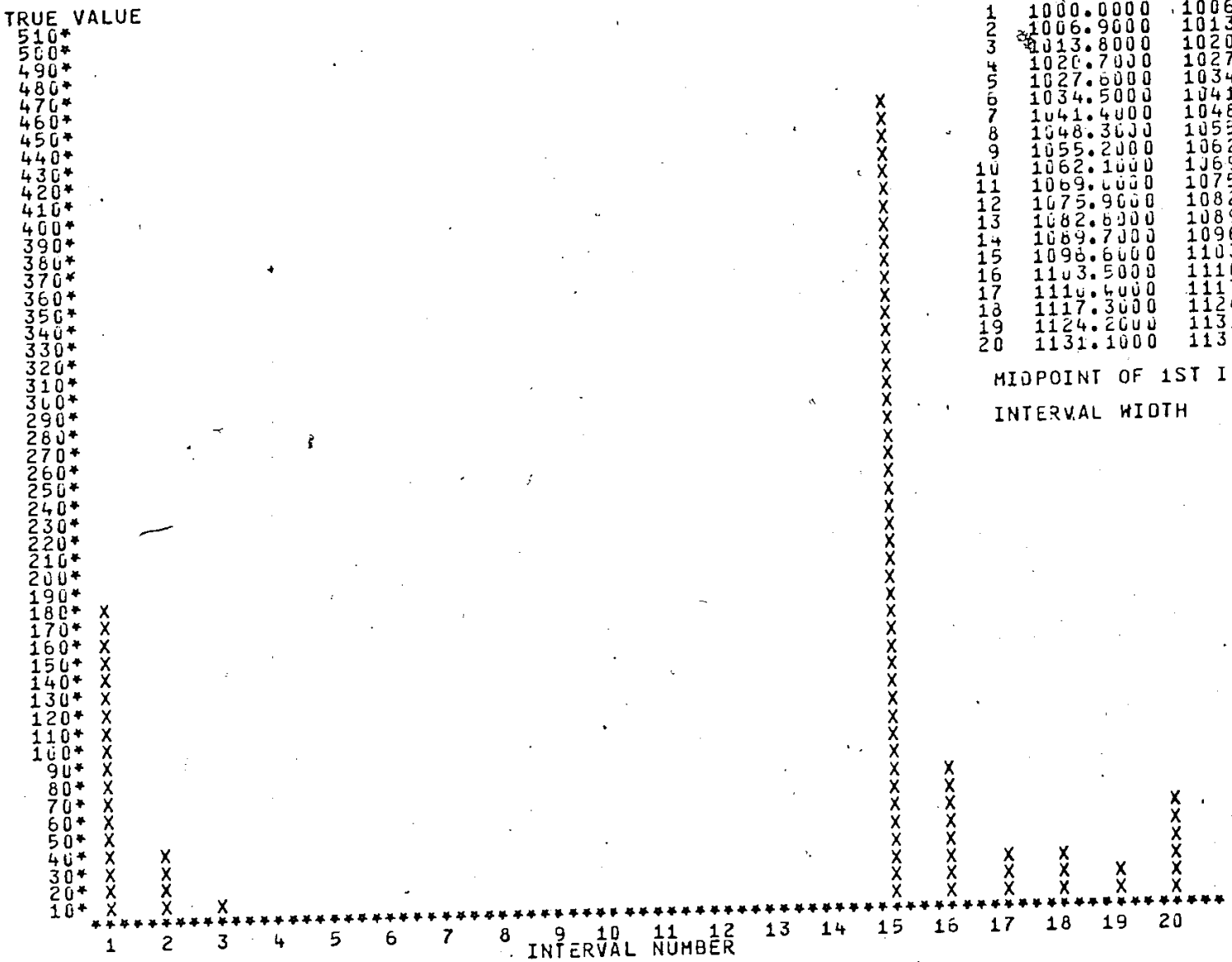


NUMBER OF POINTS PLOTTED 189

C Y S O E M

HISTOGRAM AND STATISTICS

WKLY DMNOD FILE NUMBER 6
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	1000.0000	1006.9000	185
2	1006.9000	1013.8000	45
3	1013.8000	1020.7000	15
4	1020.7000	1027.6000	0
5	1027.6000	1034.5000	5
6	1034.5000	1041.4000	0
7	1041.4000	1048.3000	5
8	1048.3000	1055.2000	0
9	1055.2000	1062.1000	0
10	1062.1000	1069.0000	0
11	1069.0000	1075.9000	0
12	1075.9000	1082.8000	0
13	1082.8000	1089.7000	0
14	1089.7000	1096.6000	0
15	1096.6000	1103.5000	466
16	1103.5000	1110.4000	80
17	1110.4000	1117.3000	35
18	1117.3000	1124.2000	30
19	1124.2000	1131.1000	20
20	1131.1000	1138.0000	60

MIDPOINT OF 1ST INTERVAL 1003.4500

INTERVAL WIDTH 6.9000

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

WKLY OMNOD FILE NUMBER 6
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	946
MINIMUM SCORE.....	1000.0000
MAXIMUM SCORE.....	1138.0000
RANGE.....	138.0000
SUM OF SCORES.....	1020990.00
SUM OF SQUARES.....	1103926600.00
MEAN.....	1079.2706
STANDARD ERROR OF THE MEAN	1.4957
STANDARD DEVIATION...	46.0041
VARIANCE.....	2116.3813
THIRD MOMENT.....	-88413.3759
FOURTH MOMENT.....	9538183.6875
SKEWNESS.....	-.908086
KURTOSIS.....	-.870499
THE MEDIAN VALUE.....	1100.0000
THE MODE VALUE.....	1100.0500
THE MODE FREQUENCY...	466.0000

CYSDEM OUTPUT STATISTICS

FOR

SMTH OMNDD FILE NUMBER 7
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 10
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

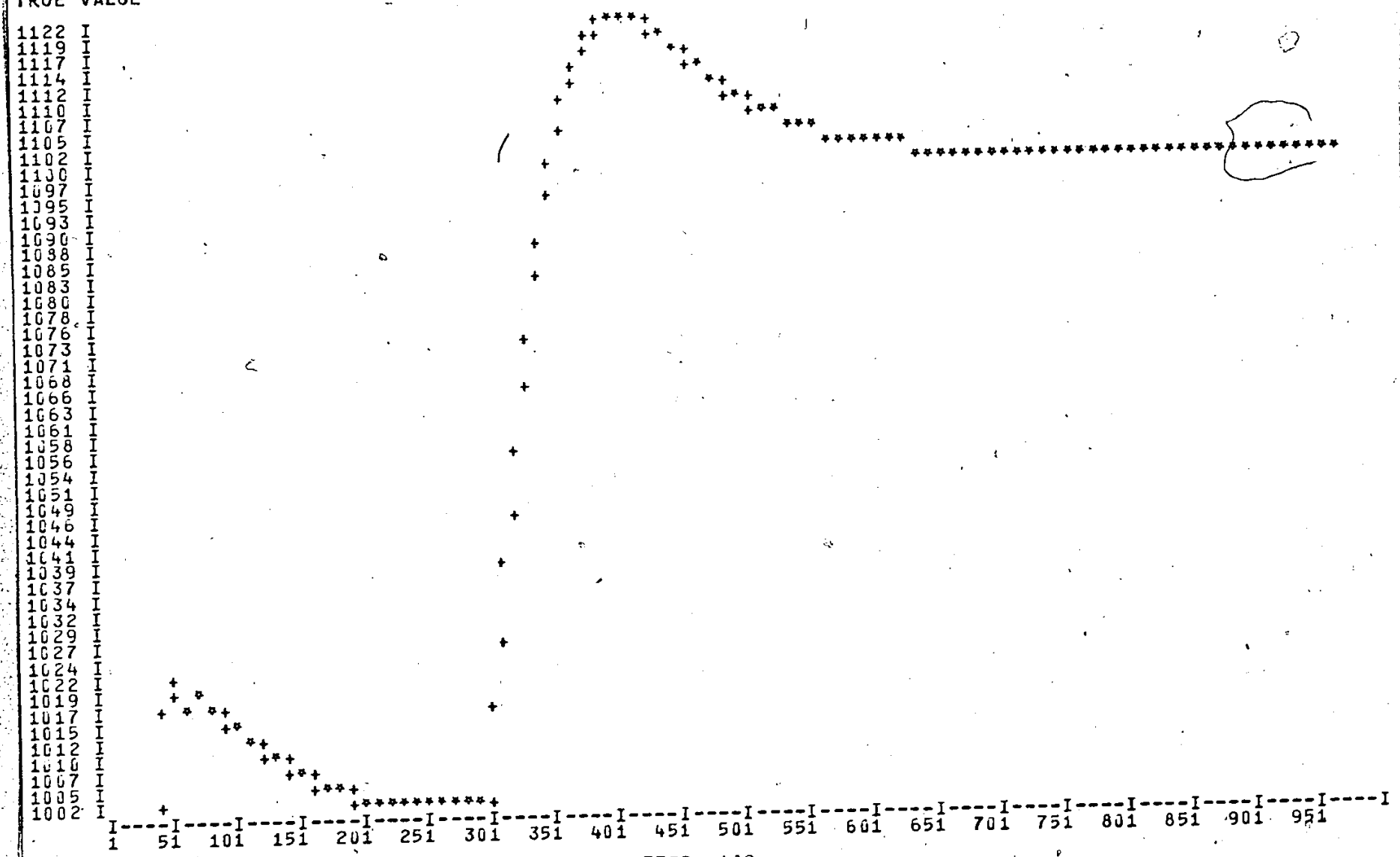
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP 0
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS

FILE NO. 7 SMTH OMNDD HAS 190 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 990

NUMBER OF PERIODS FOR VALUE2 = 44

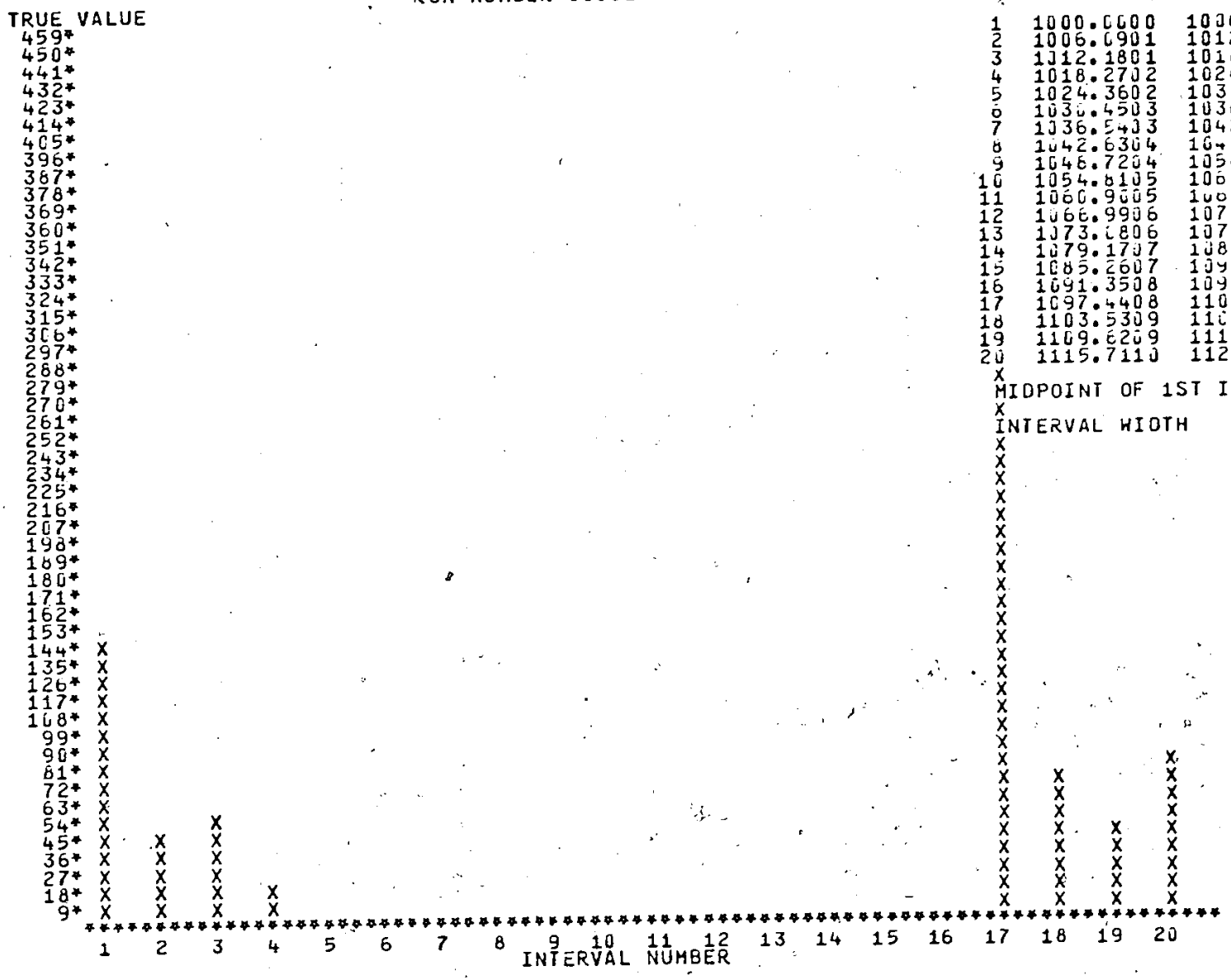
CYSDEM TIME PLOT
FOR
SMTH DMNDD FILE NUMBER 7
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 189

C Y S O E M
HISTOGRAM AND STATISTICS

SMTH DMNOD FILE NUMBER 7
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	1000.0000	1006.0901	145
2	1006.0901	1012.1801	45
3	1012.1801	1018.2702	60
4	1018.2702	1024.3602	20
5	1024.3602	1030.4503	5
6	1030.4503	1036.5403	0
7	1036.5403	1042.6304	5
8	1042.6304	1048.7204	5
9	1048.7204	1054.8105	0
10	1054.8105	1060.9005	5
11	1060.9005	1066.9906	5
12	1066.9906	1073.0806	0
13	1073.0806	1079.1707	5
14	1079.1707	1085.2607	5
15	1085.2607	1091.3508	5
16	1091.3508	1097.4408	5
17	1097.4408	1103.5309	421
18	1103.5309	1109.6209	75
19	1109.6209	1115.7110	50
20	1115.7110	1121.8010	85

MIDPOINT OF 1ST INTERVAL 1003.0450

INTERVAL WIDTH 6.0901

C Y S O E M

DESCRIPTIVE STATISTICS
FOR

SMTH OMNOD FILE NUMBER 7
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	946
MINIMUM SCORE.....	1000.0000
MAXIMUM SCORE.....	1121.8010
RANGE.....	121.8010
SUM OF SCORES.....	1016990.00
SUM OF SQUARES.....	1095158389.30
MEAN.....	1075.0423
STANDARD ERROR OF THE MEAN	1.4382
STANDARD DEVIATION...	44.2357
VARIANCE.....	1956.7937
THIRD MOMENT.....	-70153.1715
FOURTH MOMENT.....	6981672.0000
SKEWNESS.....	-.810457
KURTOSIS.....	-1.176653
THE MEDIAN VALUE.....	1100.0130
THE MODE VALUE.....	1100.4658
THE MODE FREQUENCY...	421.0000

CYSDEM OUTPUT STATISTICS

FOR

INV LEVL D FILE NUMBER 8
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 1
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

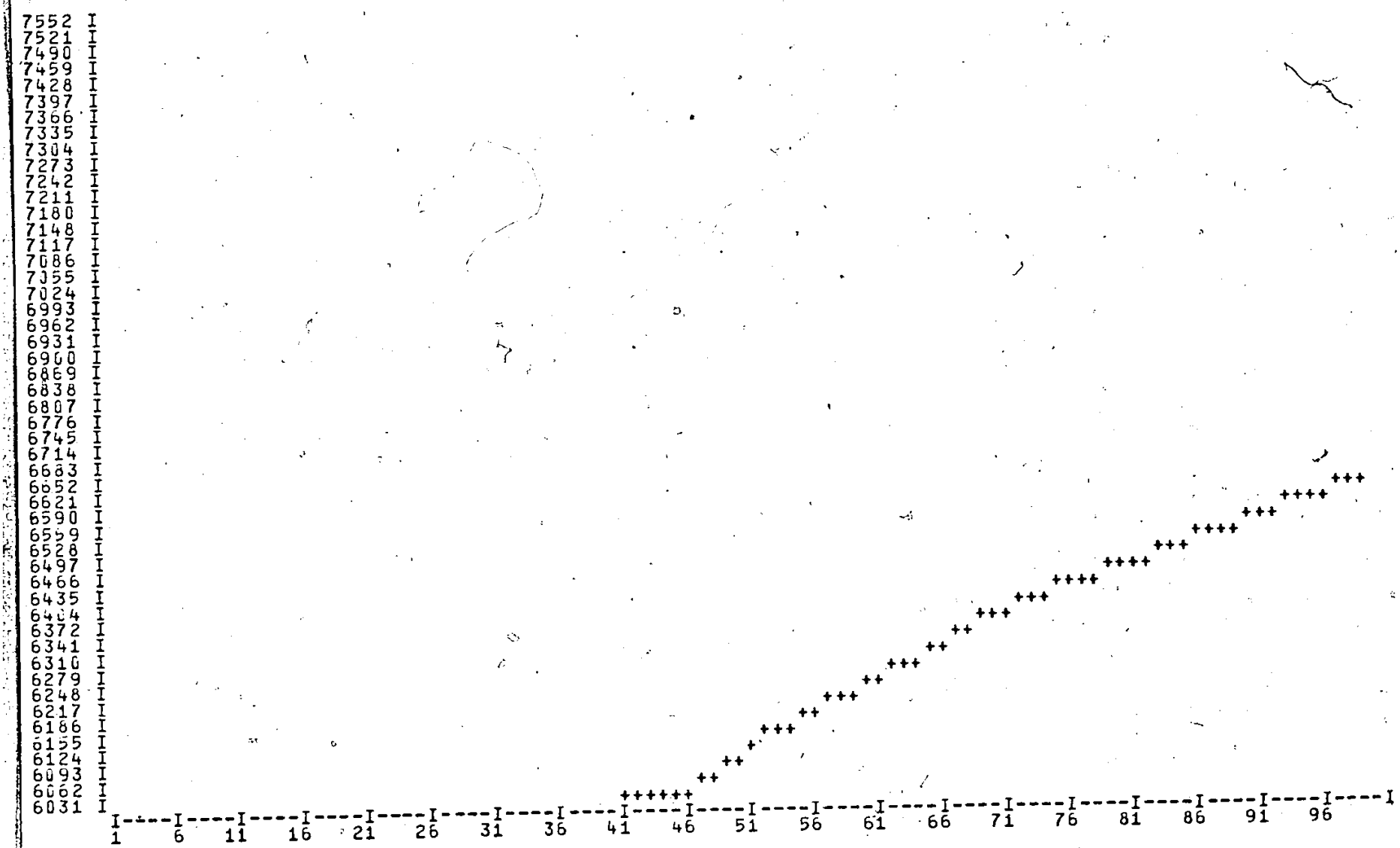
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 8 INV LEVL D HAS 958 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 998

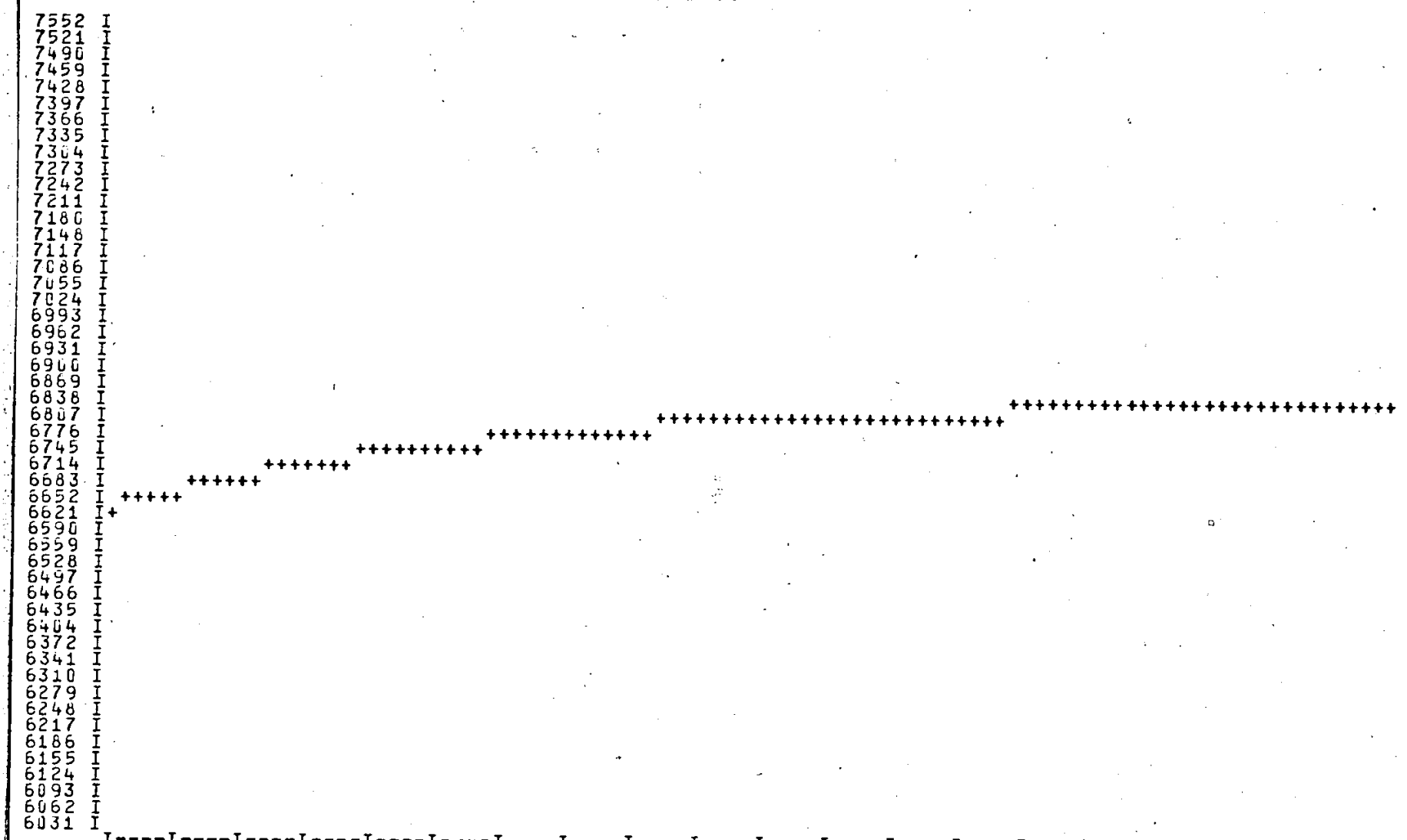
NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001



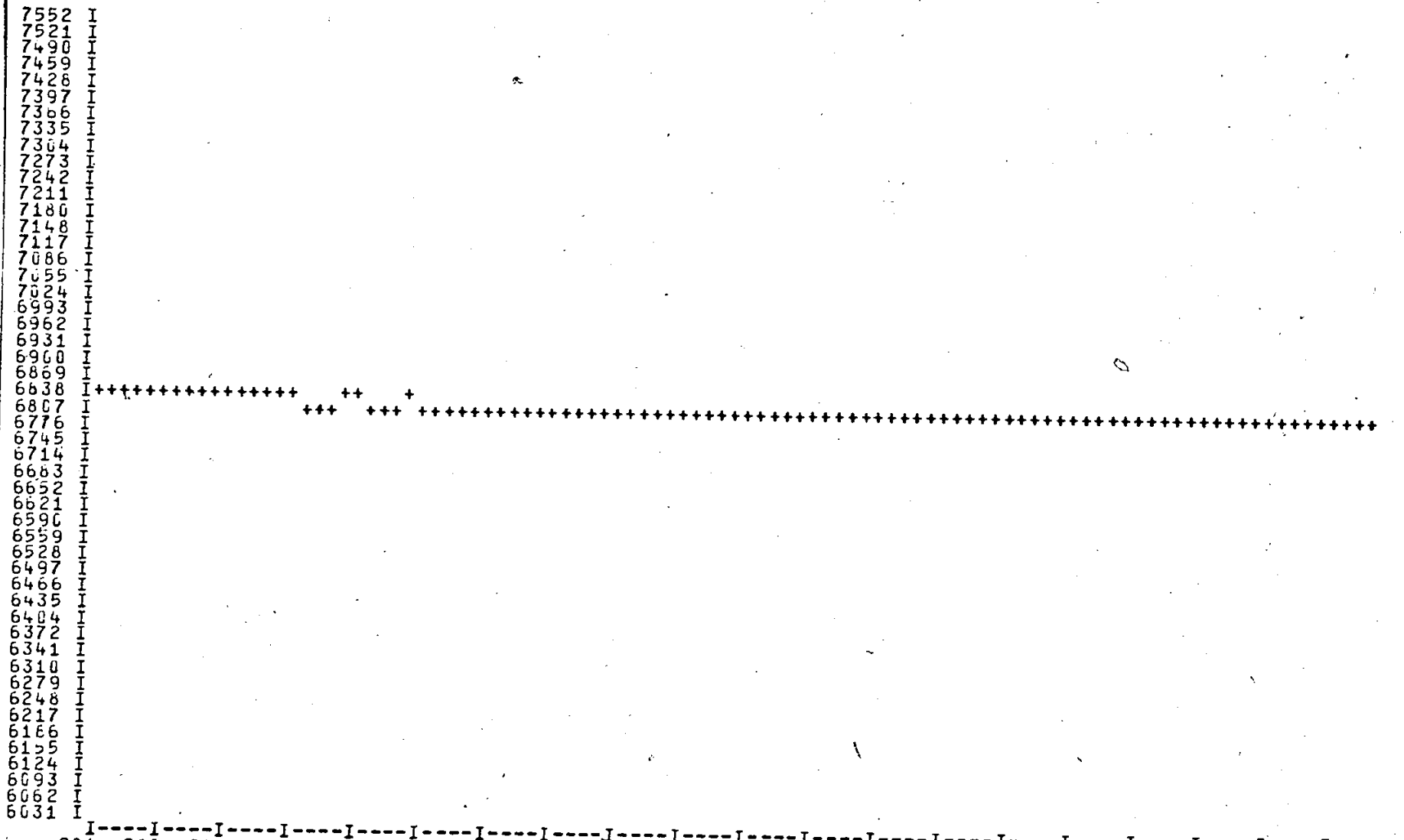
NUMBER OF POINTS PLOTTED 59

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001



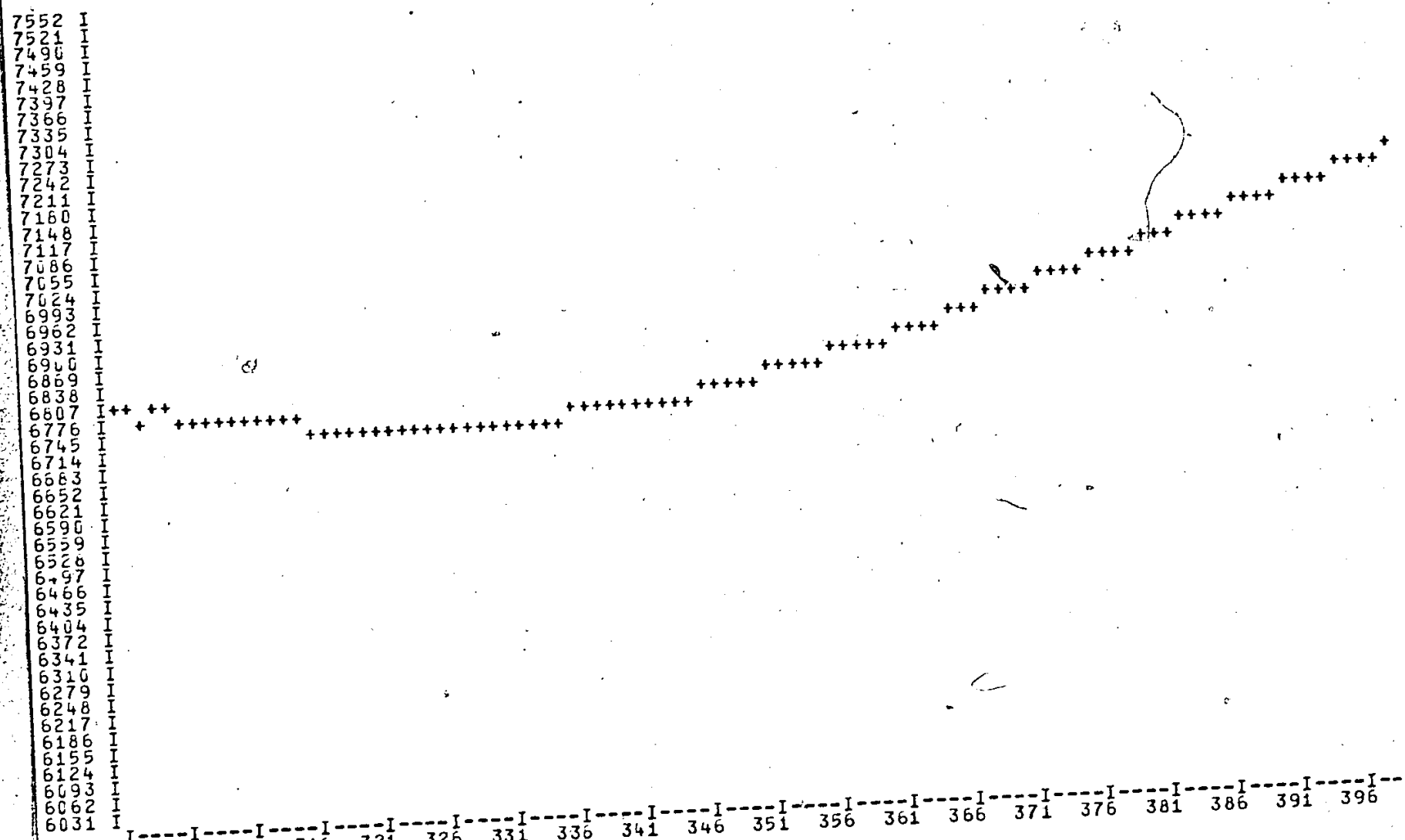
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL 0 FILE NUMBER 8
RUN NUMBER 00001



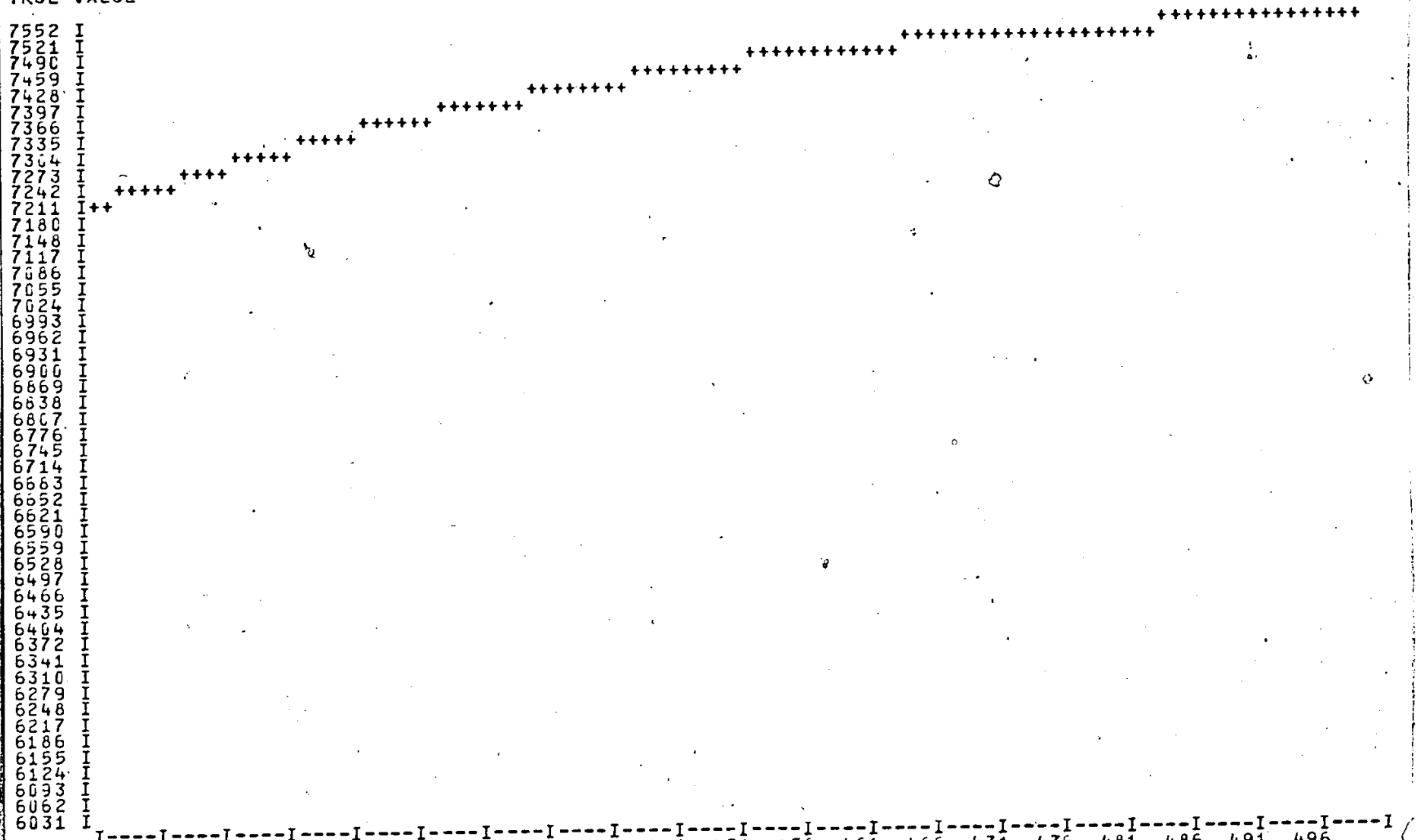
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001



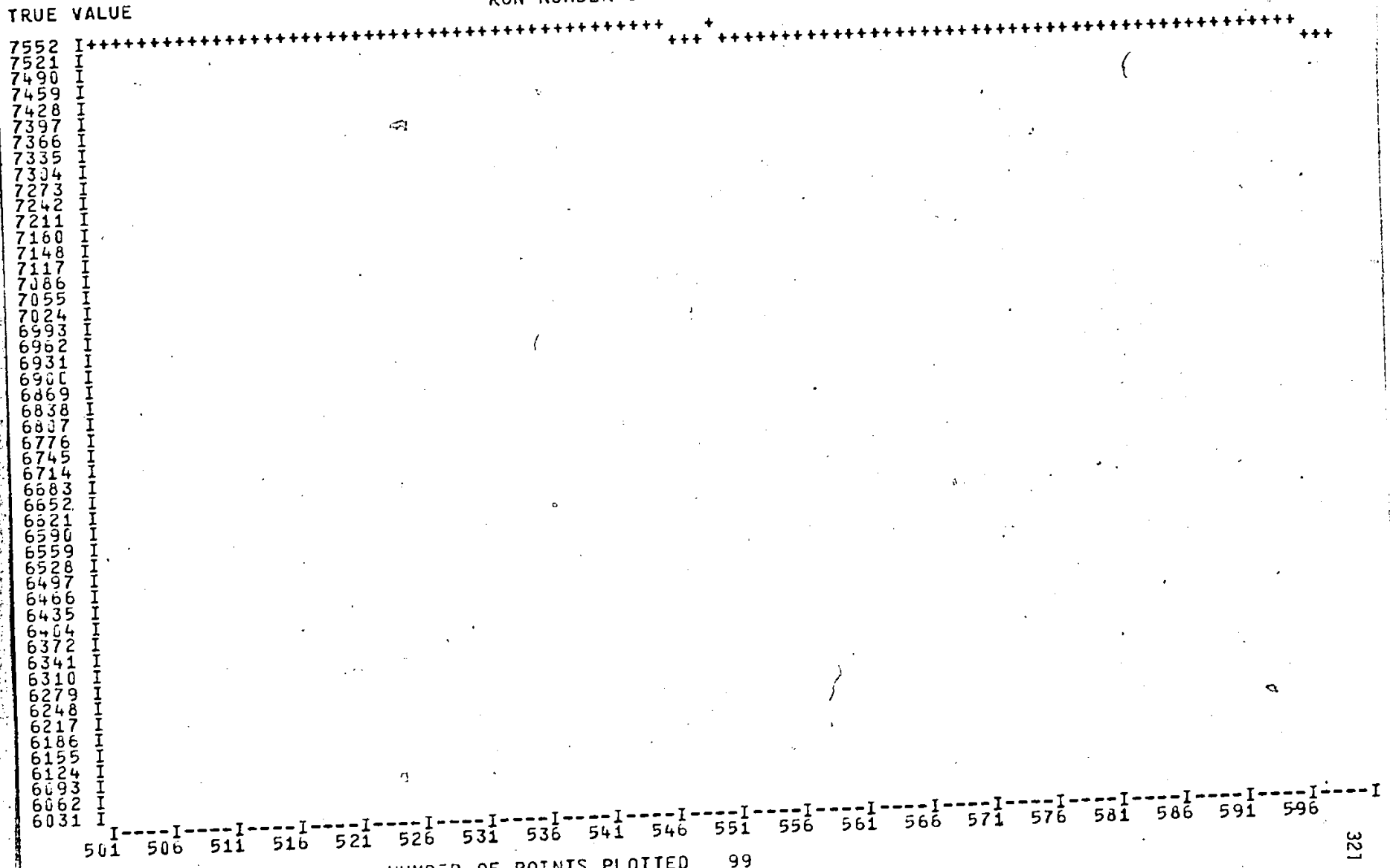
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL 0 FILE NUMBER 8
RUN NUMBER 00001



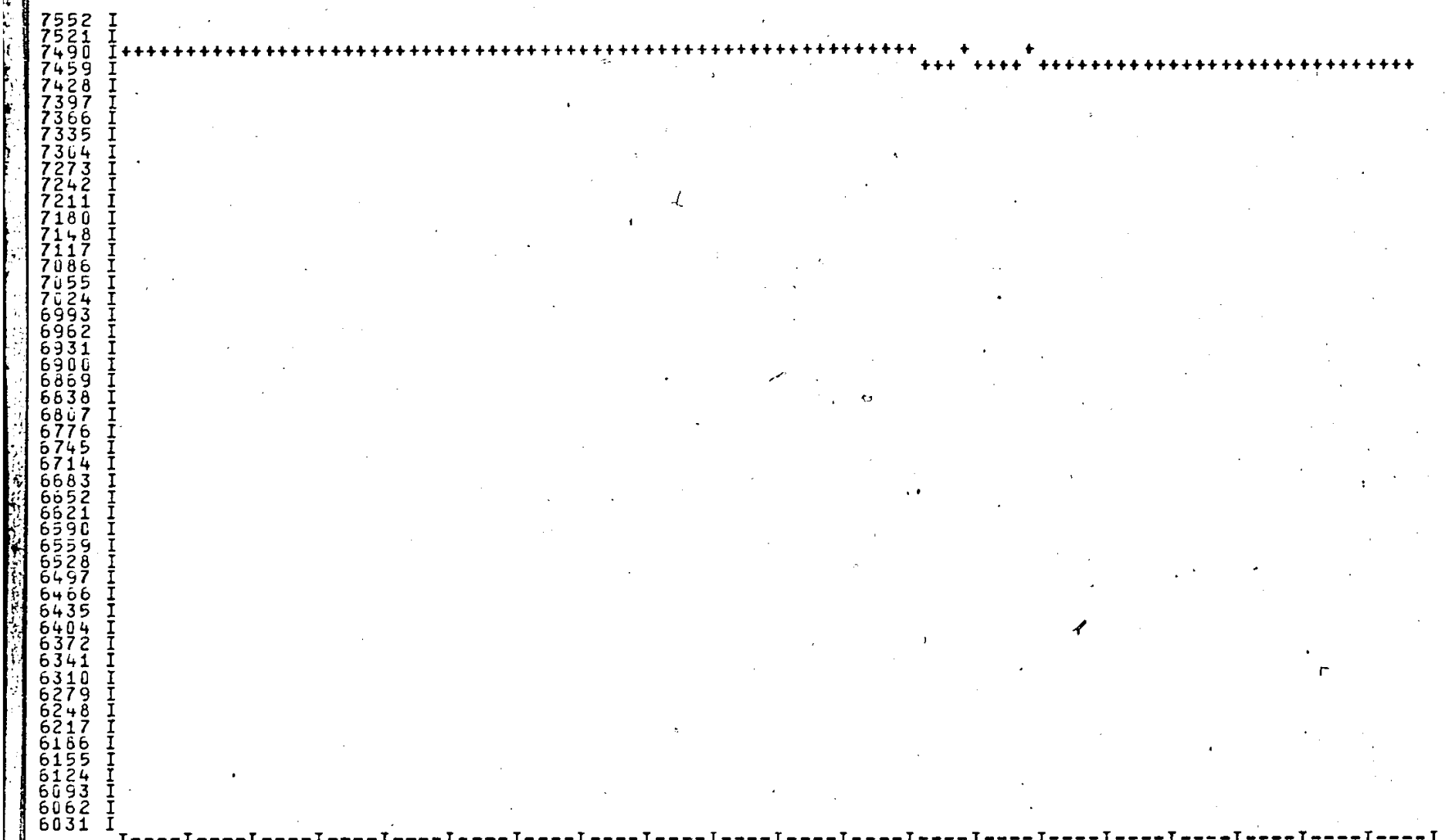
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001



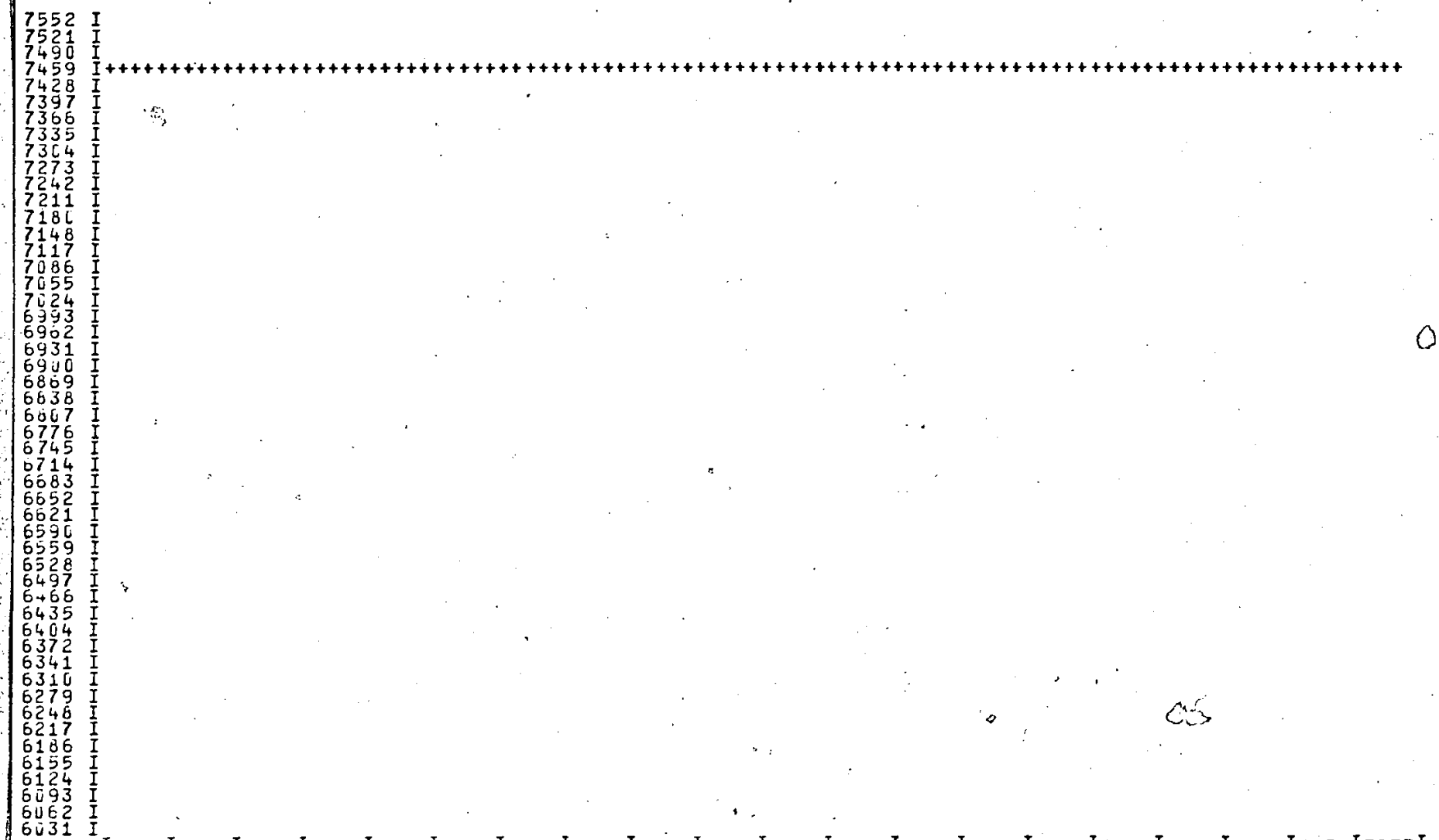
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL 0 FILE NUMBER 8
RUN NUMBER 00001



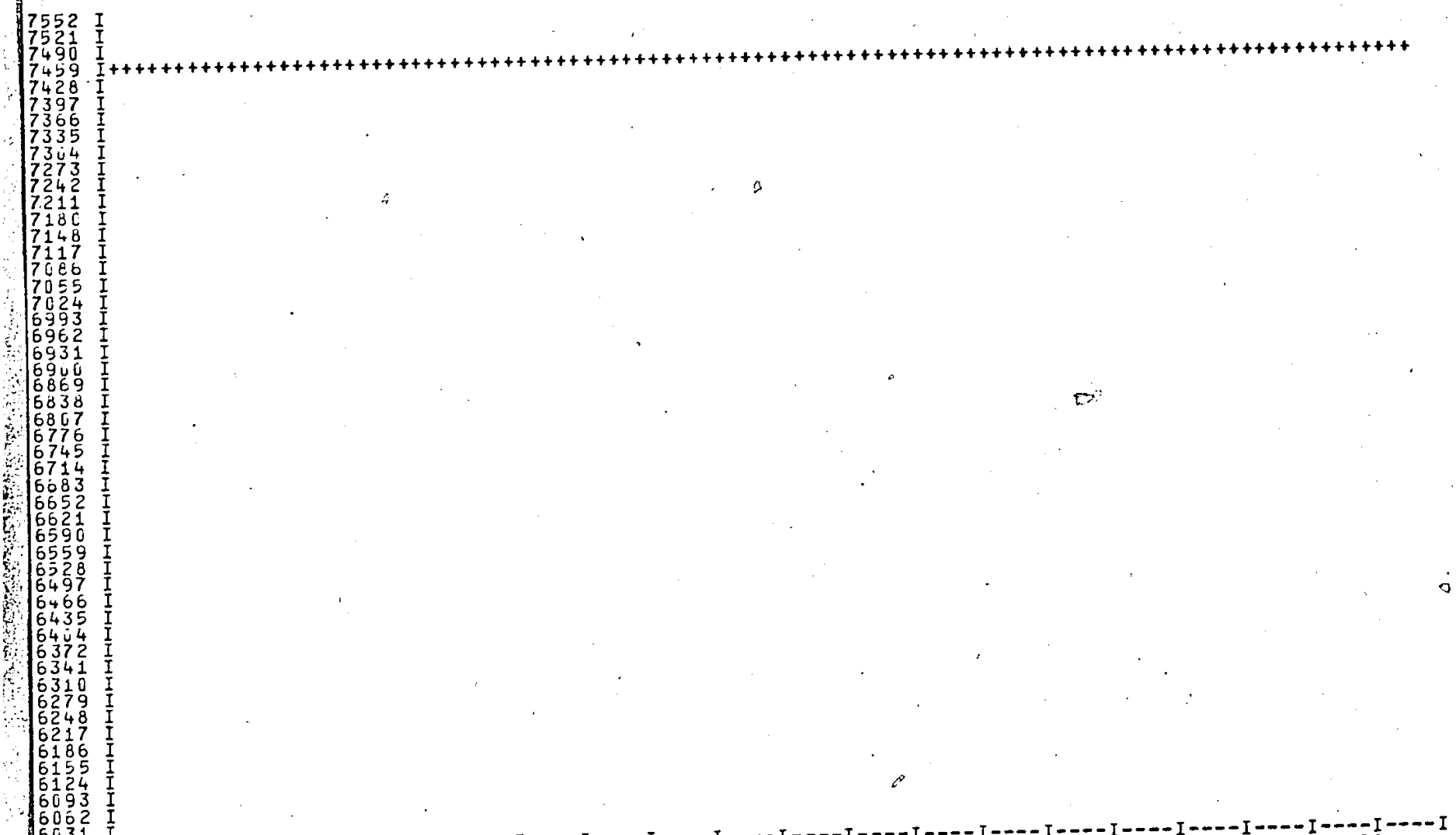
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL 0 FILE NUMBER 8
RUN NUMBER 00001



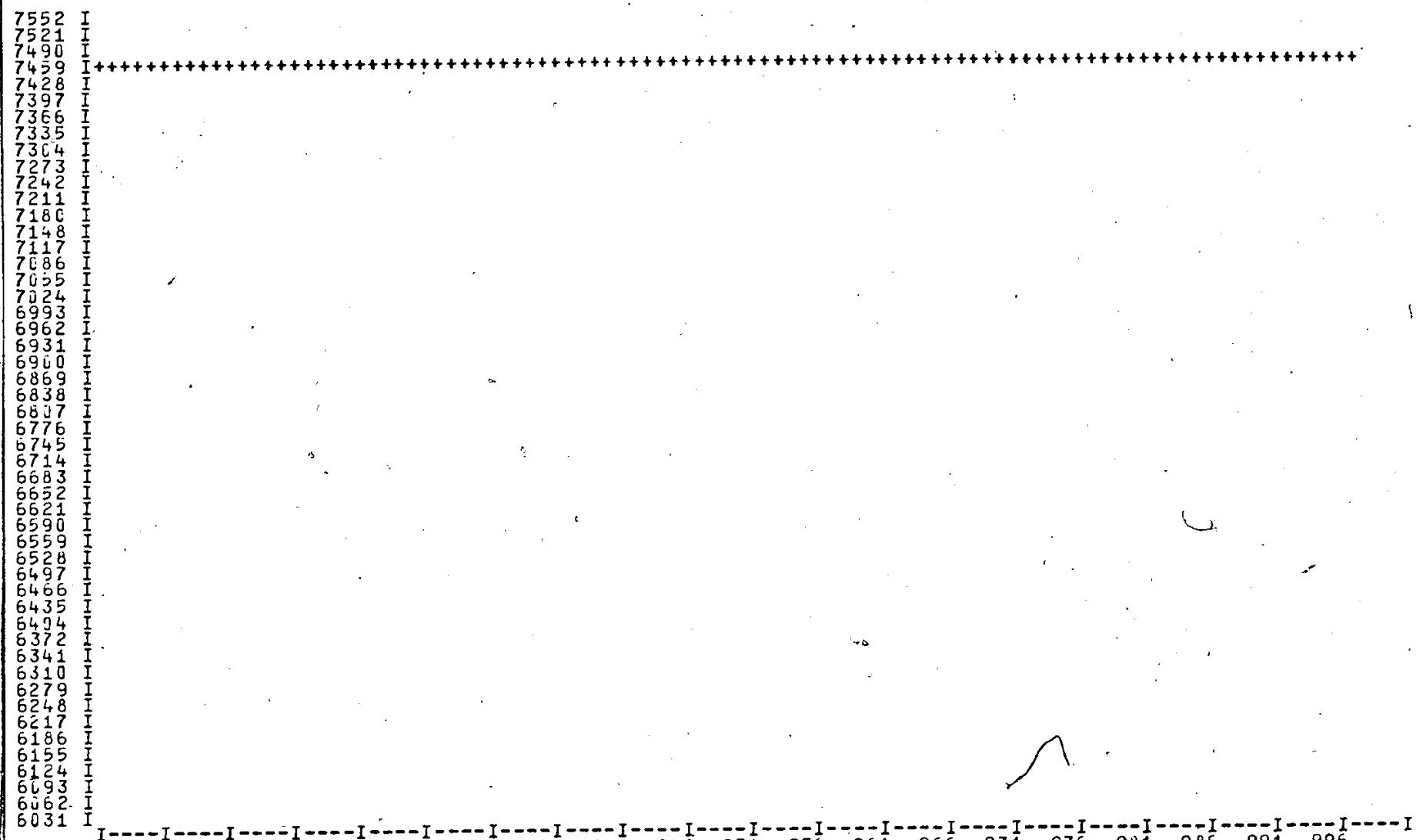
NUMBER OF POINTS PLOTTED = 99

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL D FILE NUMBER 8
RUN NUMBER 00001

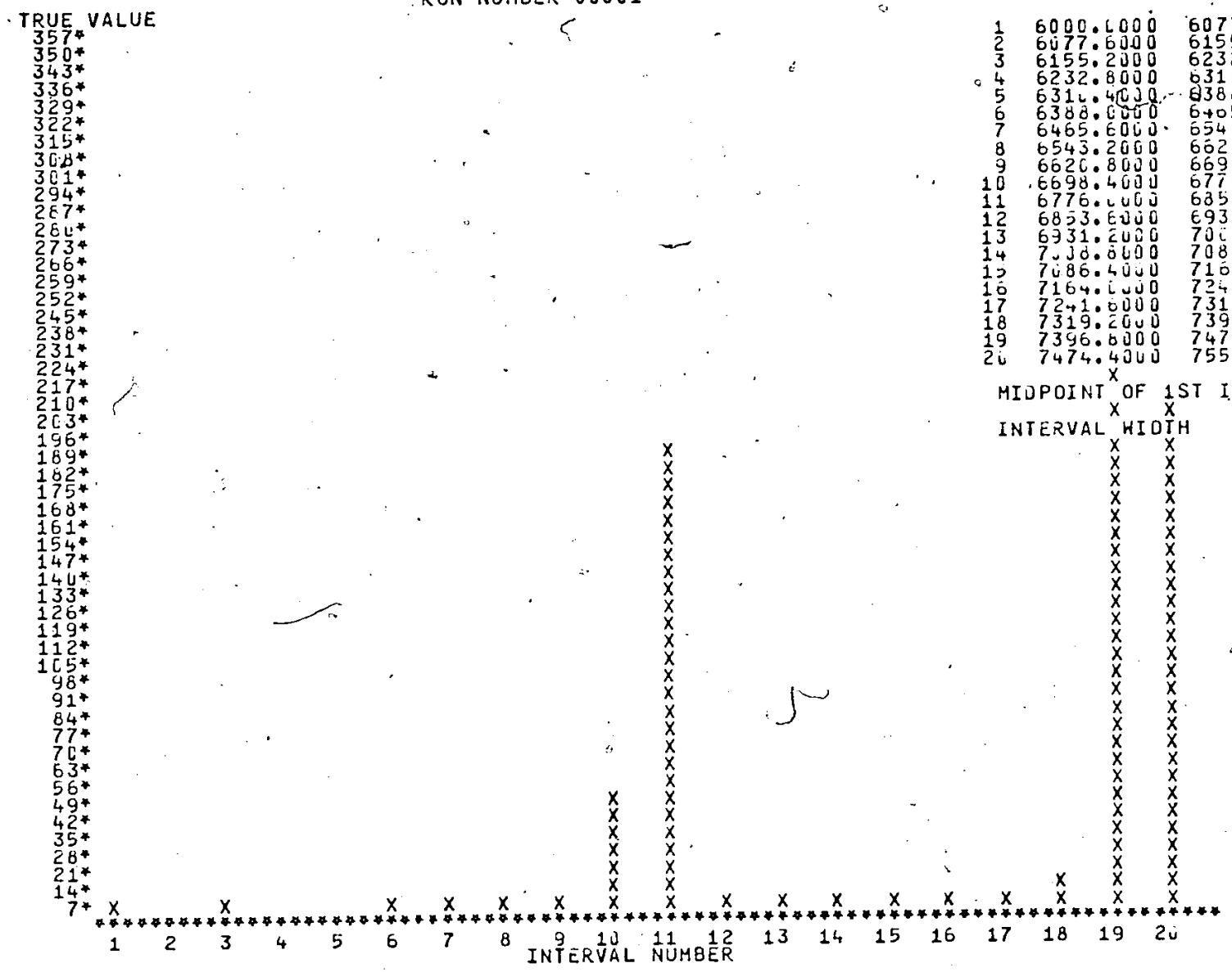


NUMBER OF POINTS PLOTTED 97

C Y S O E M

HISTOGRAM AND STATISTICS

INV LEVL 0 FILE NUMBER 8
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	6000.0000	6077.6000	8
2	6077.6000	6155.2000	4
3	6155.2000	6232.8000	7
4	6232.8000	6310.4000	6
5	6310.4000	6388.0000	6
6	6388.0000	6465.6000	9
7	6465.6000	6543.2000	9
8	6543.2000	6620.8000	10
9	6620.8000	6698.4000	13
10	6698.4000	6776.0000	51
11	6776.0000	6853.6000	192
12	6853.6000	6931.2000	10
13	6931.2000	7008.8000	10
14	7008.8000	7086.4000	10
15	7086.4000	7164.0000	9
16	7164.0000	7241.6000	11
17	7241.6000	7319.2000	11
18	7319.2000	7396.8000	14
19	7396.8000	7474.4000	35
20	7474.4000	7552.0000	212

MIDPOINT OF 1ST INTERVAL 6038.8000

INTERVAL WIDTH 77.6000

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

INV LEVL D FILE NUMBER 8
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	958
MINIMUM SCORE.....	6000.0000
MAXIMUM SCORE.....	7552.0000
RANGE.....	1552.0000
SUM OF SCORES.....	6895552.00
SUM OF SQUARES.....	49769416454.00
MEAN.....	7197.8622
STANDARD ERROR OF THE MEAN	12.1814
STANDARD DEVIATION...	377.0328
VARIANCE.....	142153.7326
THIRD MOMENT.....	-50419562.4531
FOURTH MOMENT.....	56131247232.0000
SKEWNESS.....	-.940723
KURTOSIS.....	-.222282
THE MEDIAN VALUE.....	7453.0000
THE MODE VALUE.....	7435.6000
THE MODE FREQUENCY...	356.0000

CYSDEM OUTPUT STATISTICS

FOR

UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 1
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

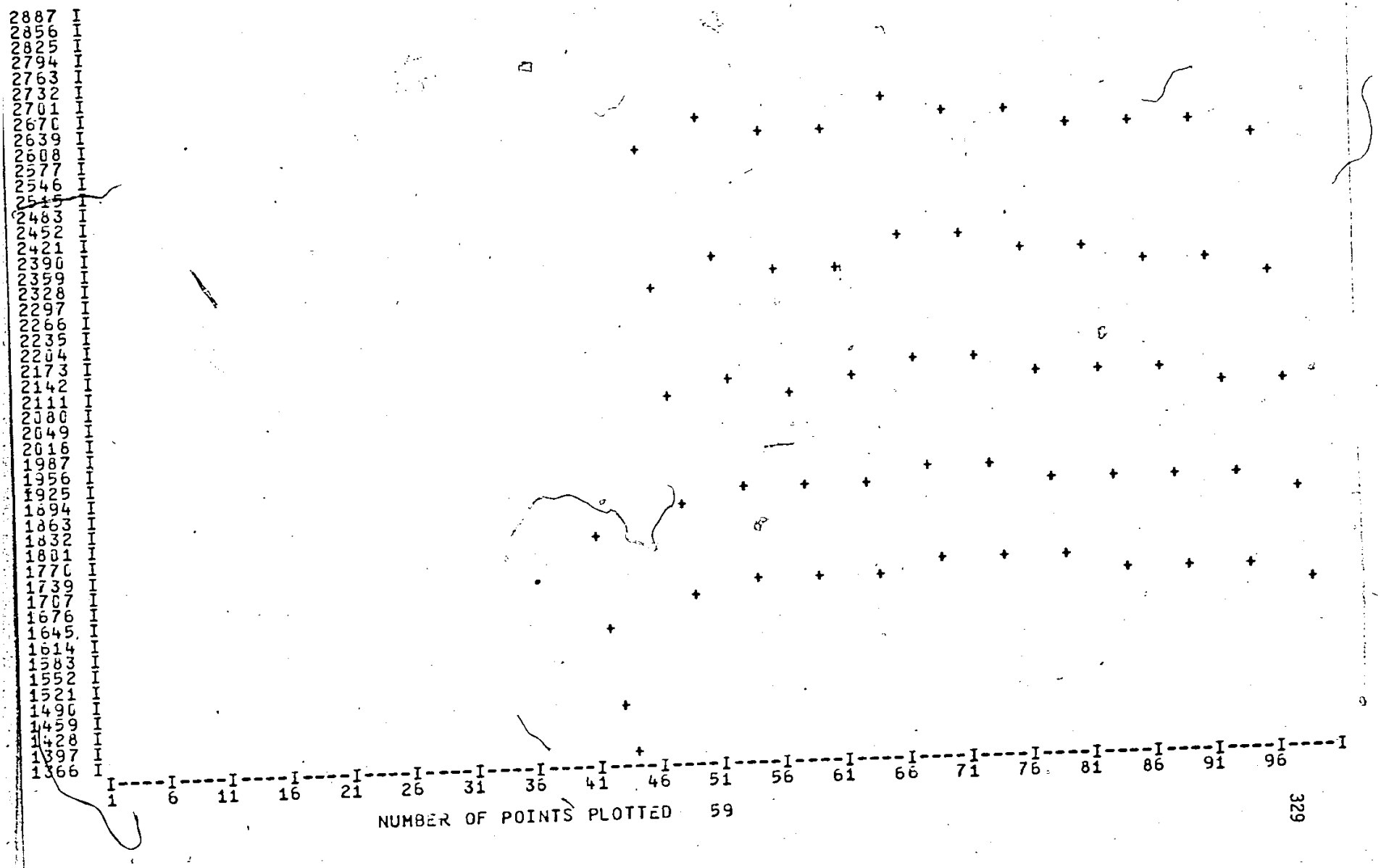
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 9 UNFLLDORDF HAS 958 DATA POINT ON FILE9

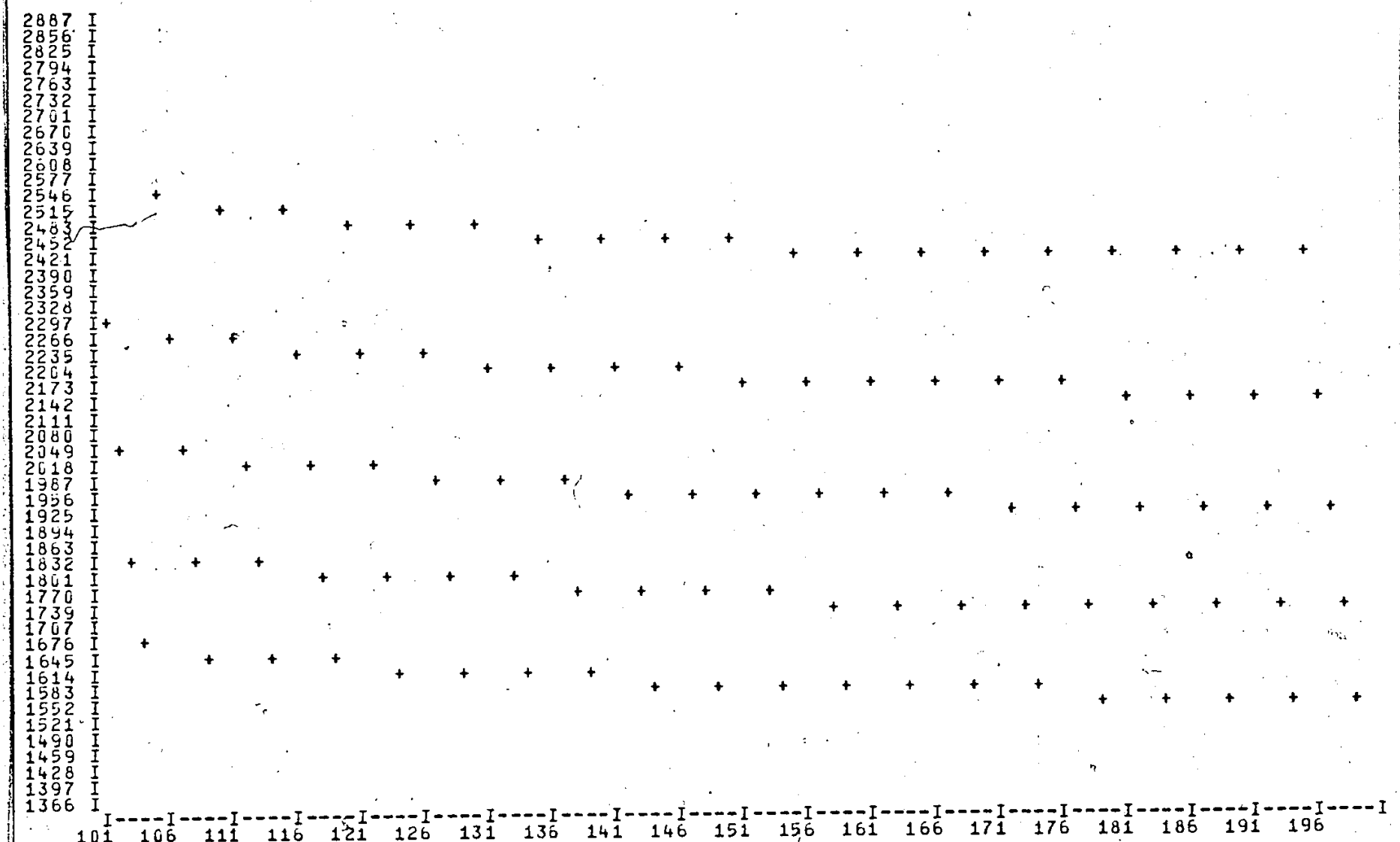
NUMBER OF PERIODS FOR VALUE1 = 998

NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001

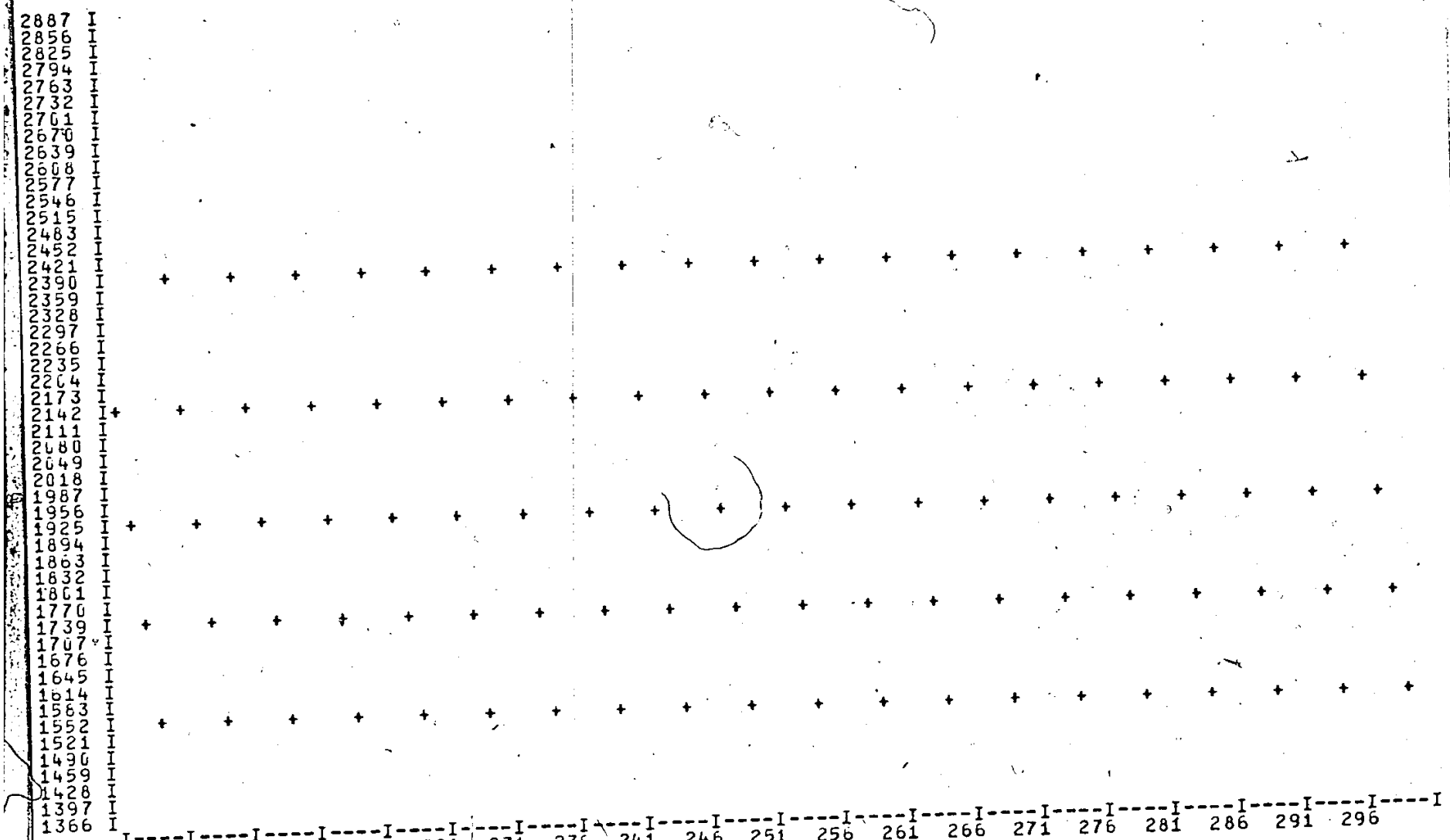


CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



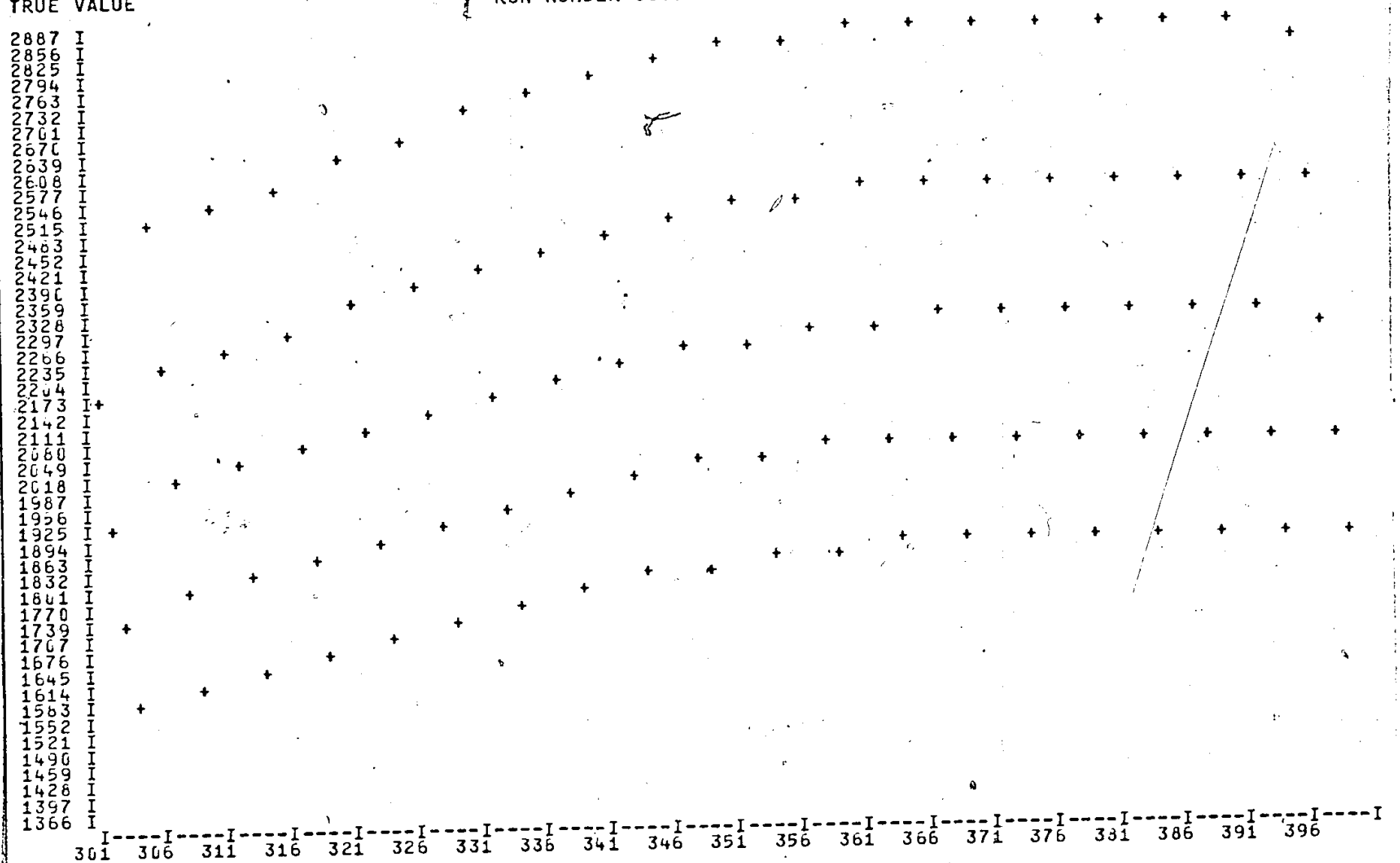
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



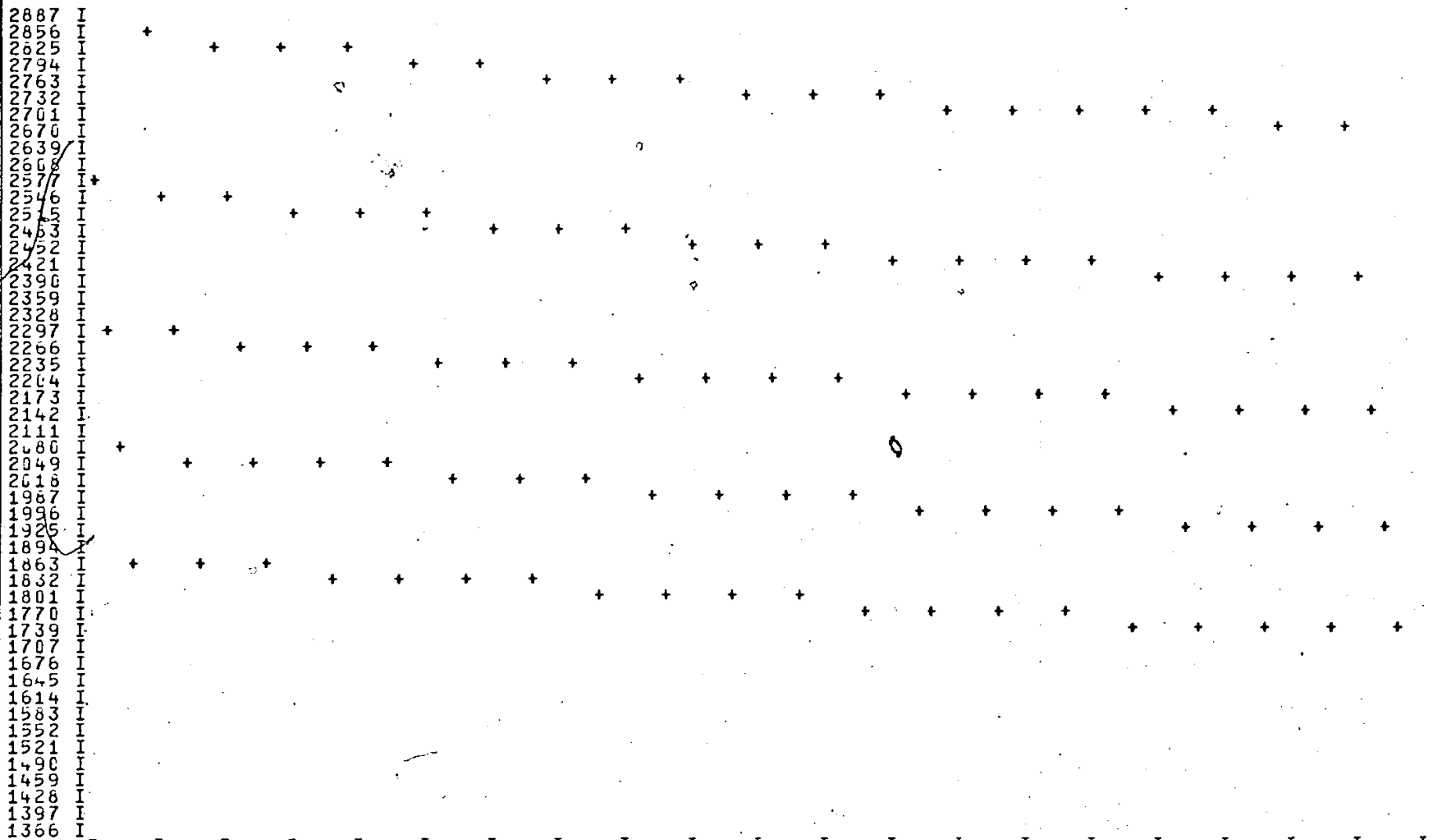
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



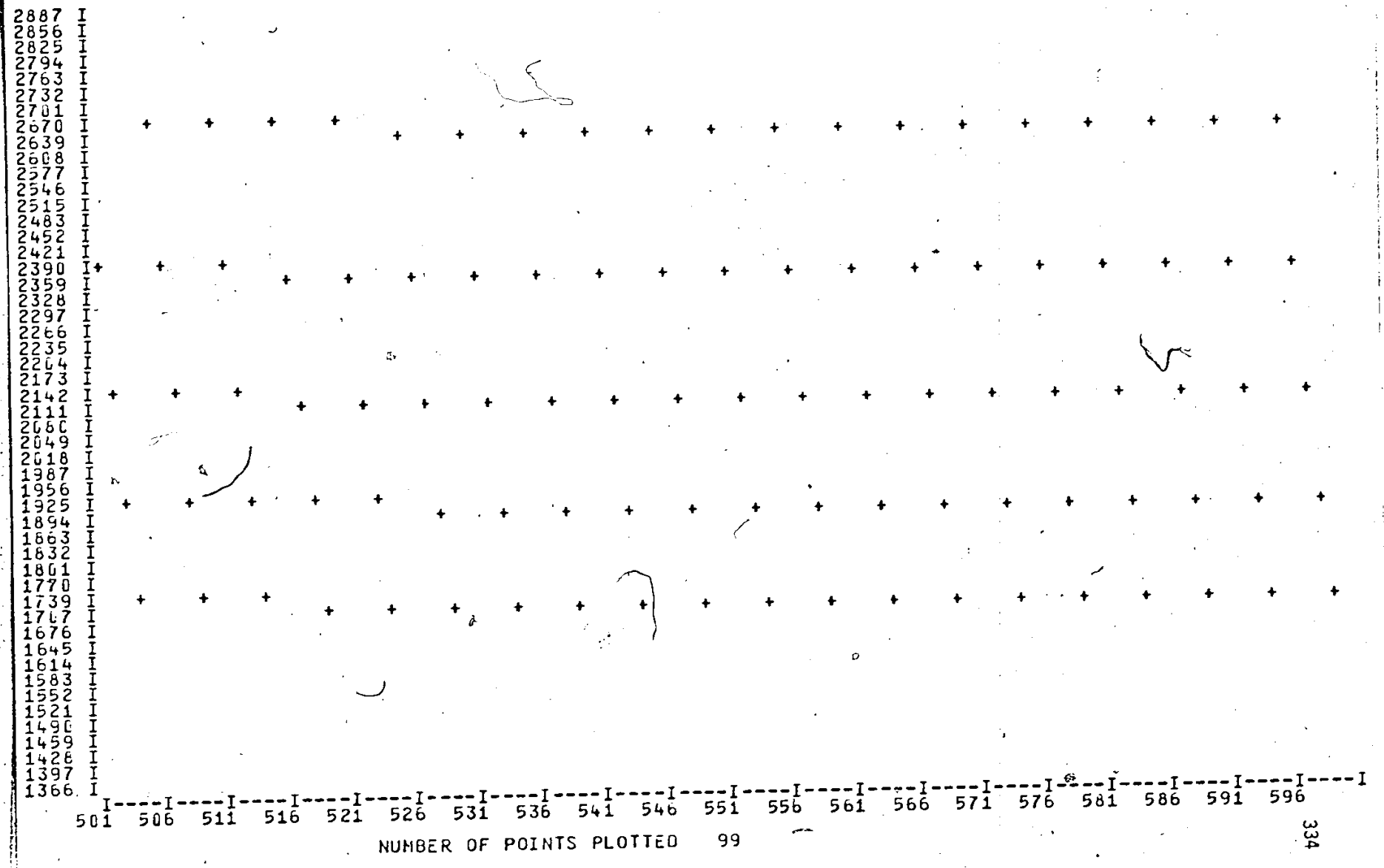
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



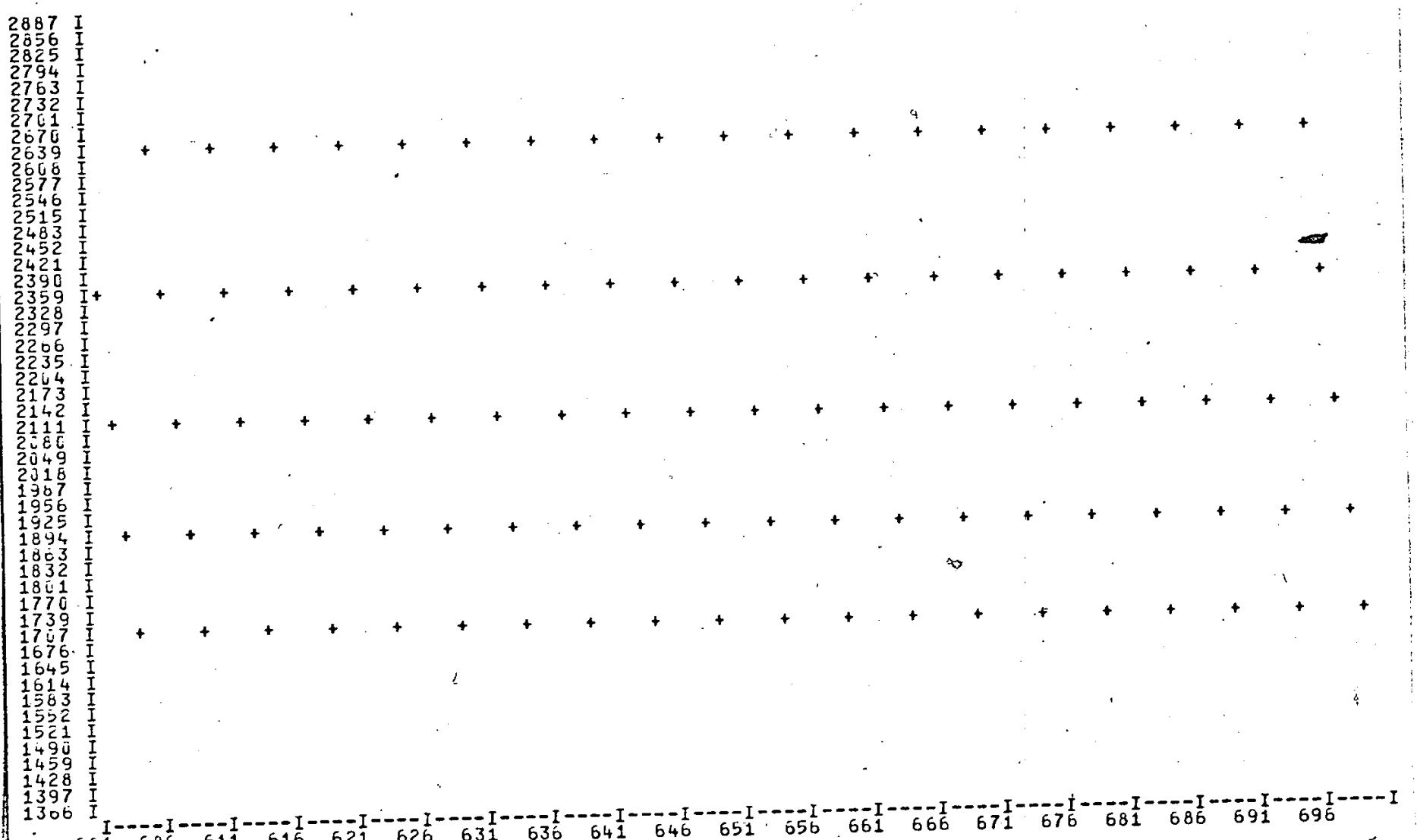
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



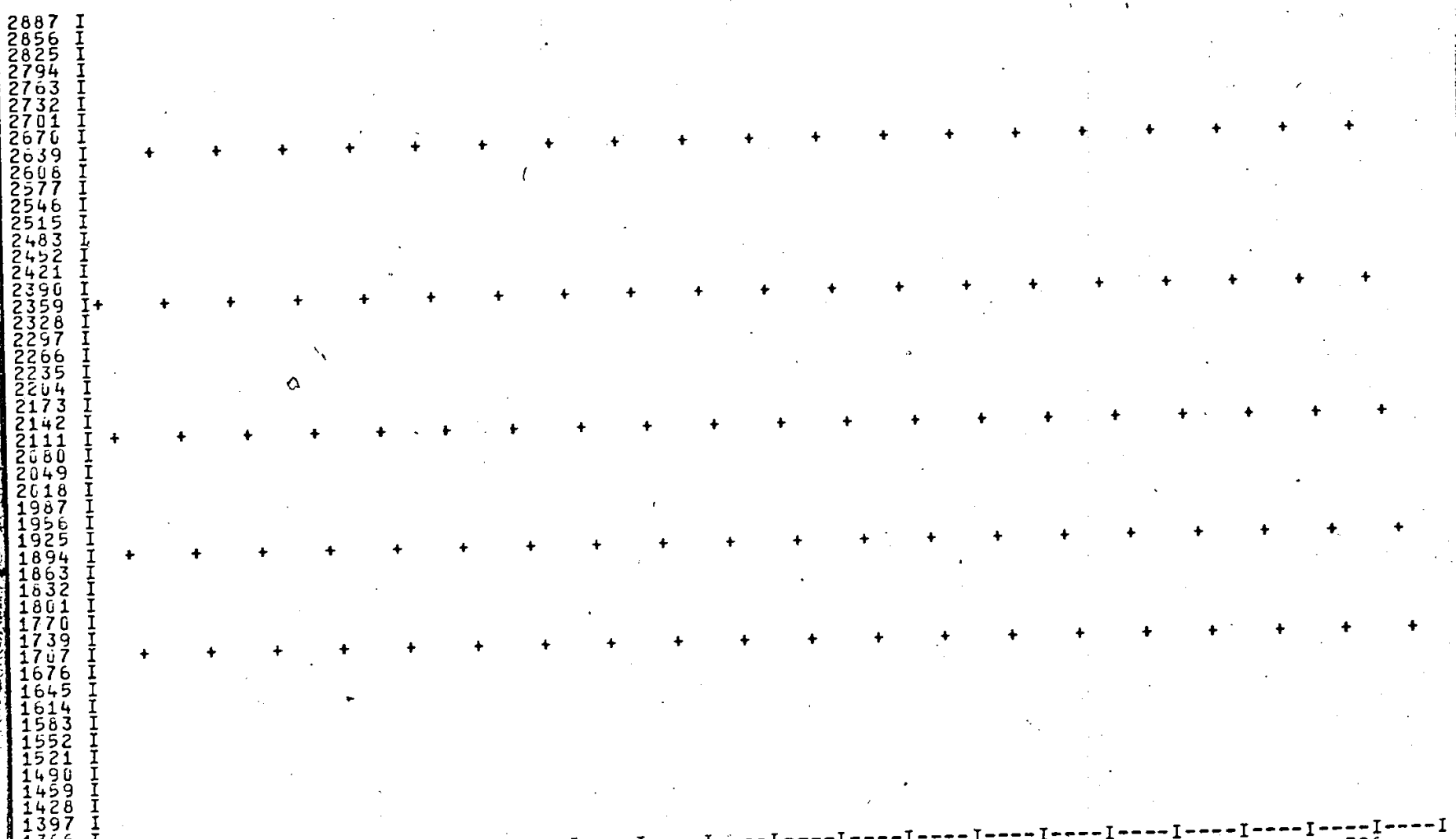
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



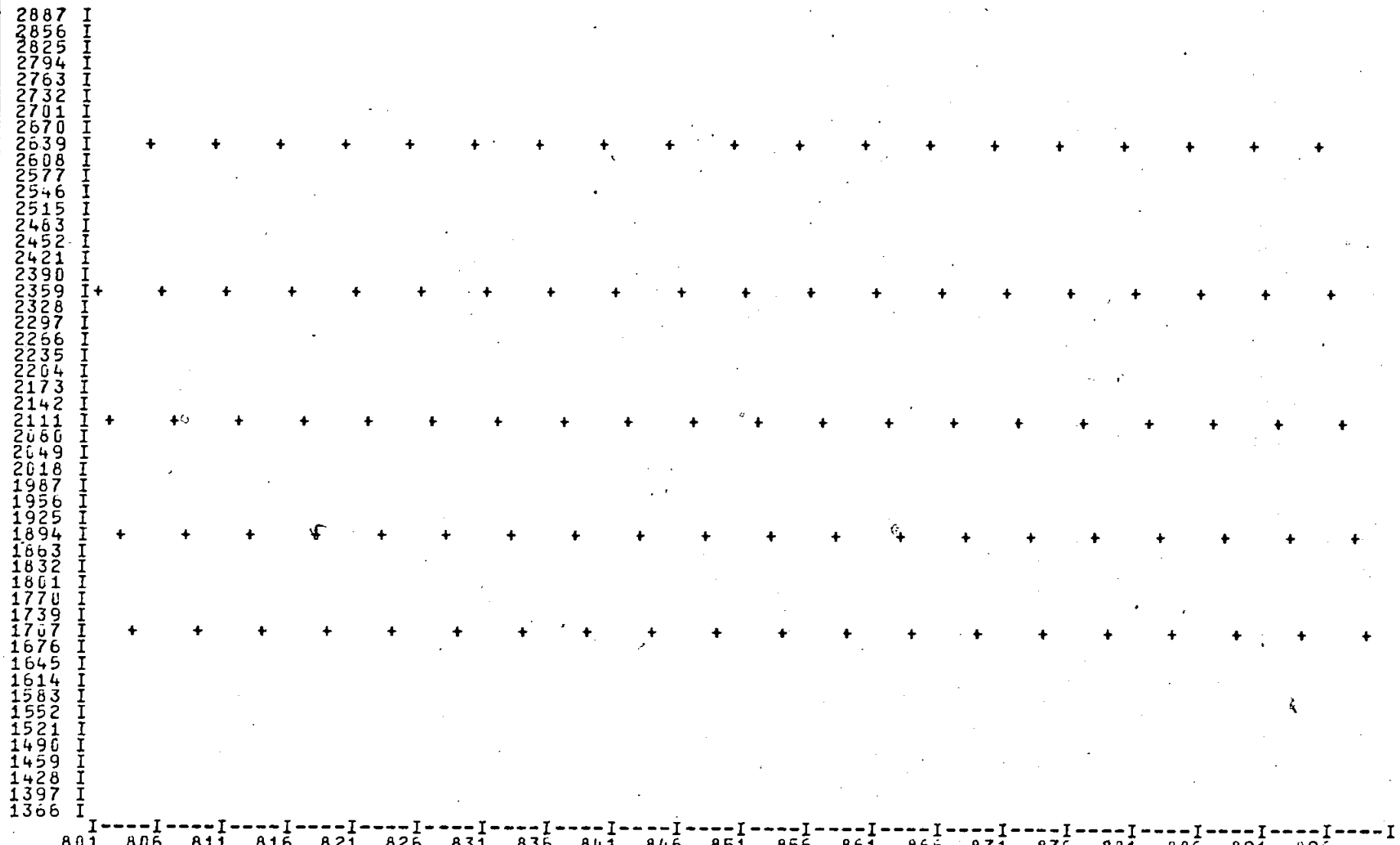
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILe NUMBER 9
RUN NUMBER 00001



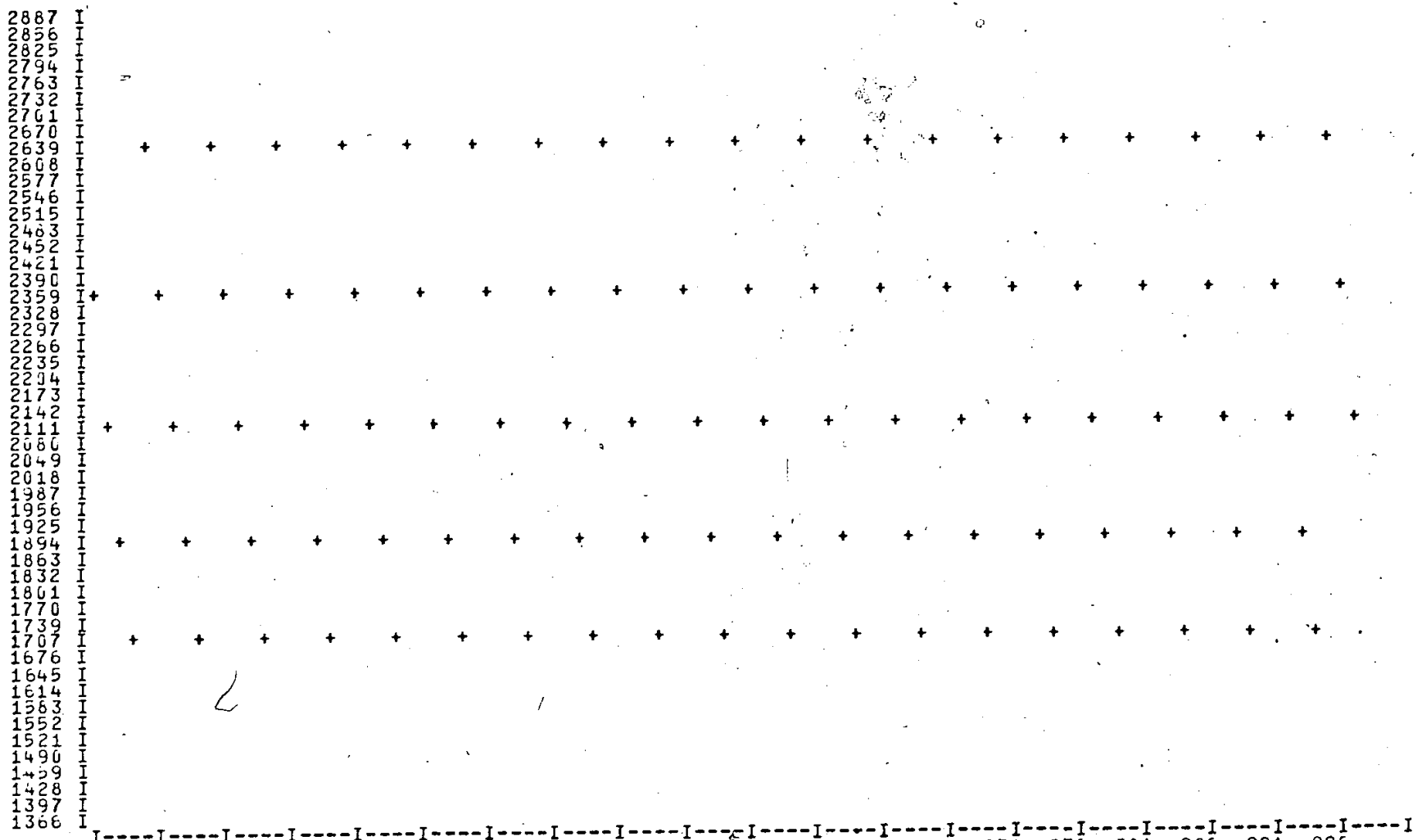
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

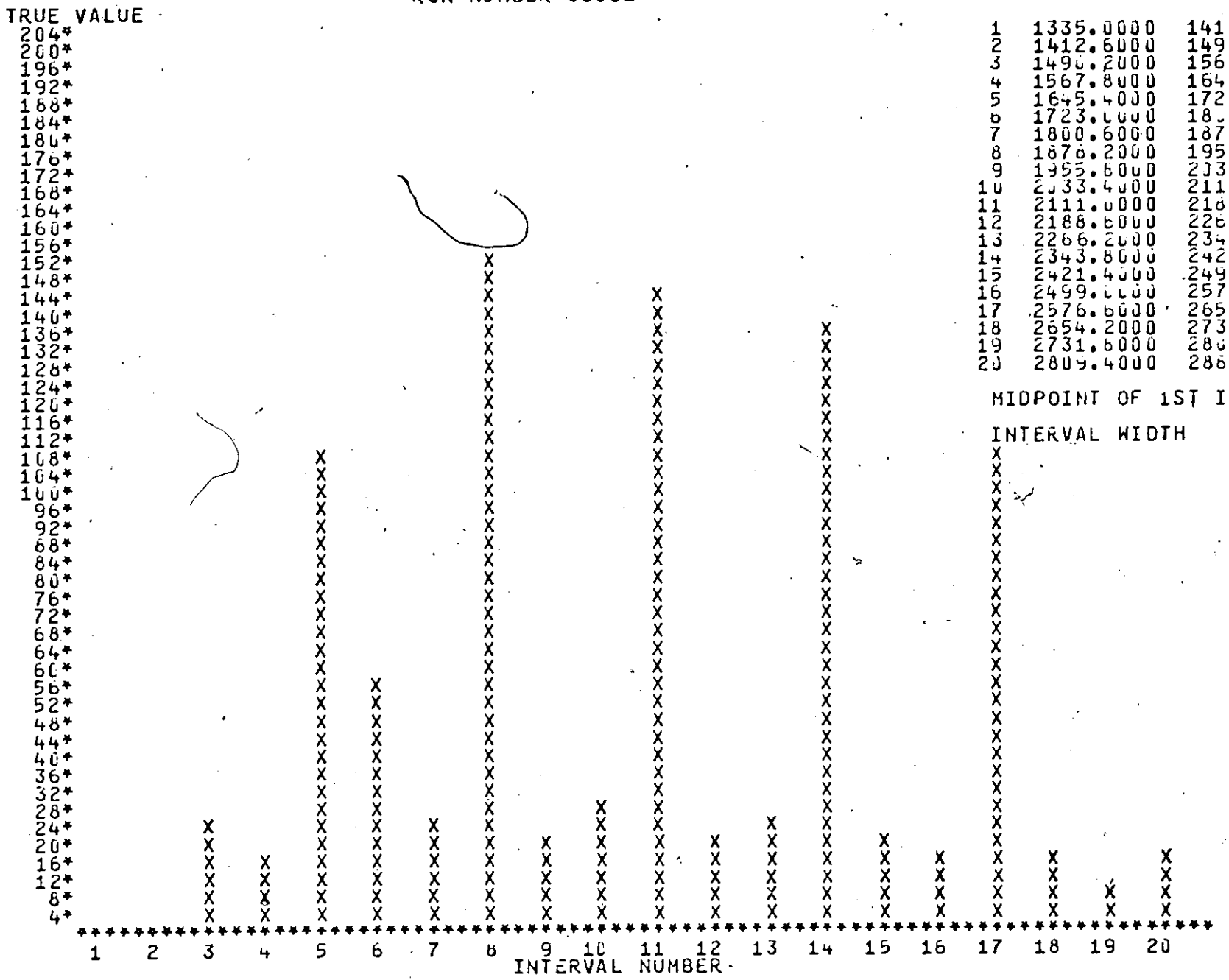
CYSDEM TIME PLOT
FOR
UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 97

C Y S D E M
HISTOGRAM AND STATISTICS

UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUEN
1	1335.0000	1412.6000	1
2	1412.6000	1490.2000	1
3	1490.2000	1567.8000	25
4	1567.8000	1645.4000	16
5	1645.4000	1723.0000	109
6	1723.0000	1800.6000	57
7	1800.6000	1878.2000	26
8	1878.2000	1955.8000	154
9	1955.8000	2033.4000	20
10	2033.4000	2111.0000	29
11	2111.0000	2188.6000	144
12	2188.6000	2266.2000	20
13	2266.2000	2343.8000	24
14	2343.8000	2421.4000	138
15	2421.4000	2499.0000	23
16	2499.0000	2576.6000	19
17	2576.6000	2654.2000	111
18	2654.2000	2731.8000	16
19	2731.8000	2809.4000	9
20	2809.4000	2887.0000	16

MIDPOINT OF 1ST INTERVAL 1373.8000

INTERVAL WIDTH 77.6000

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

UNFLLDORDF FILE NUMBER 9
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	958
MINIMUM SCORE.....	1335.0000
MAXIMUM SCORE.....	2887.0000
RANGE.....	1552.0000
SUM OF SCORES.....	2041645.00
SUM OF SQUARES.....	4463851353.00
MEAN.....	2131.1534
STANDARD ERROR OF THE MEAN	11.0860
STANDARD DEVIATION...	343.1291
VARIANCE.....	117737.5558
THIRD MOMENT.....	9293464.0994
FOURTH MOMENT.....	27581780385.5000
SKEWNESS.....	.230641
KURTOSIS.....	-1.010279
THE MEDIAN VALUE.....	2117.0000
THE MODE VALUE.....	1917.0000
THE MODE FREQUENCY...	154.0000

CYSDEM OUTPUT STATISTICS

FOR

WKLY OMNDF FILE NUMBER 10
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM ..... 1 TO 1000

TIME COMPRESSION FACTOR IS 10
THIS IS USED FOR COMPRESSION OF PLOTS ONLY

MAXIMUM ACTIVITY CODE 0
IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED

PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY..... VALUE 1

PRINT TABLES..... NO

PUNCH ON FILE7..... NO

WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT
IF ZERO, NO PLOTS ARE PRINTED..... 11

NO. OF INTERVALS ON THE HISTOGRAM (GROUPS)
MAY HAVE UP TO 20 INTERVALS
IF ZERO, NO HISTOGRAM PRINTED..... 20

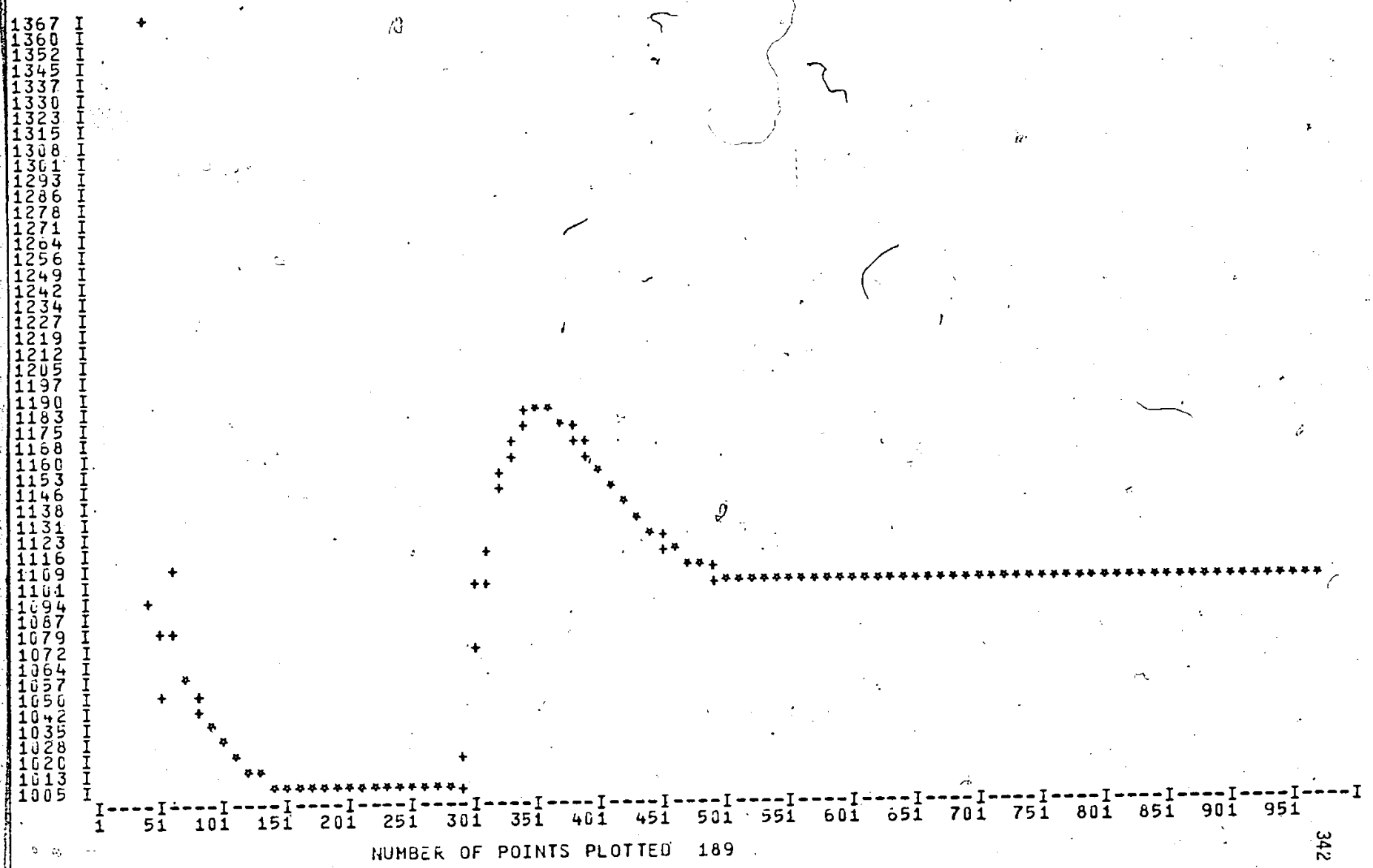
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP
SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS 0

FILE NO. 10 WKLY OMNDF HAS 190 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 990

NUMBER OF PERIODS FOR VALUE2 = 44

CYSDEM TIME PLOT
FOR
WKLY DMNDF FILE NUMBER 10
RUN NUMBER 00001

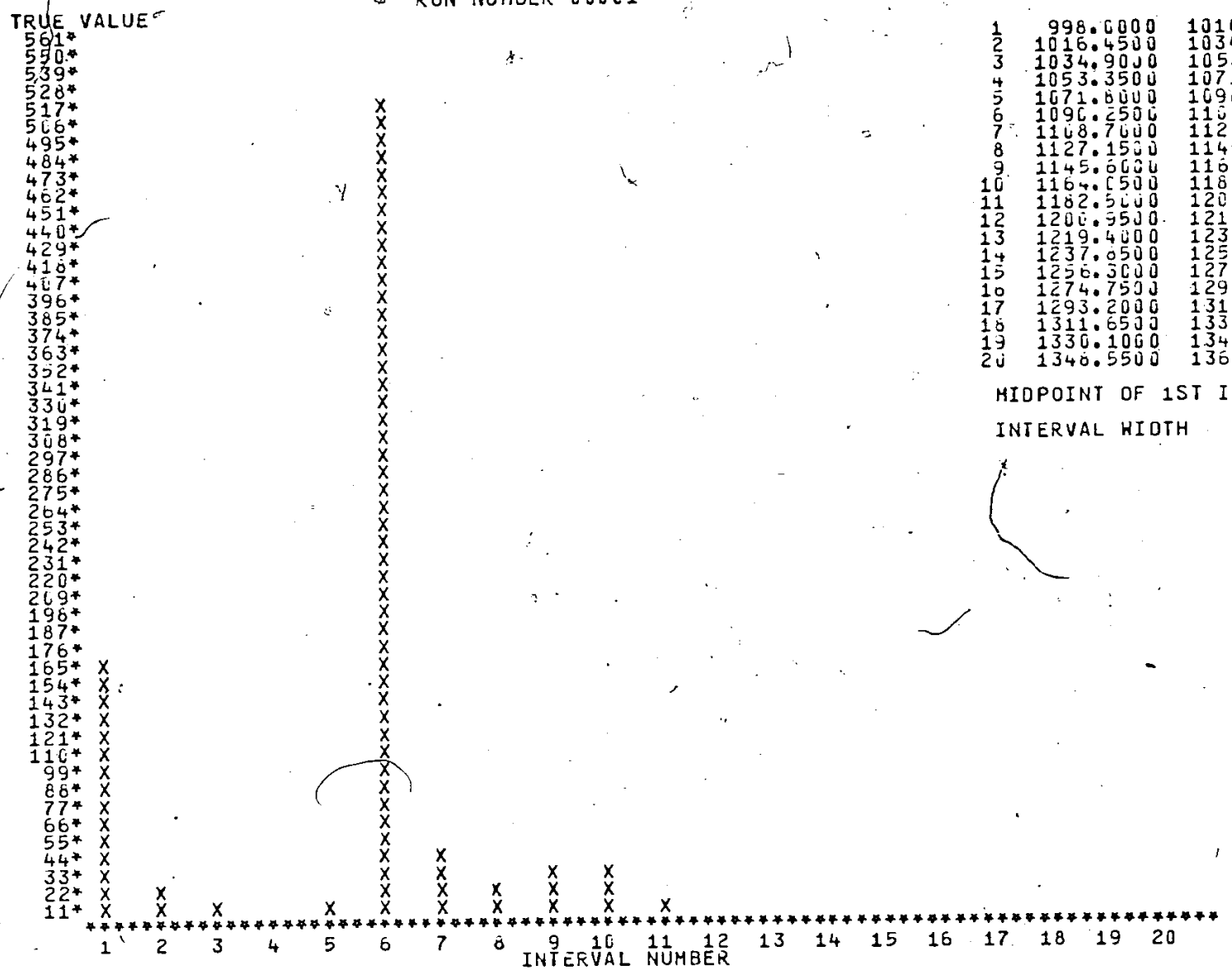


NUMBER OF POINTS PLOTTED 189

C Y S D E M

HISTOGRAM AND STATISTICS

HKLY DMNDF FILE NUMBER 10
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUEN
1	998.0000	1016.4500	175
2	1016.4500	1034.9000	30
3	1034.9000	1053.3500	20
4	1053.3500	1071.8000	10
5	1071.8000	1090.2500	15
6	1090.2500	1108.7000	520
7	1108.7000	1127.1500	45
8	1127.1500	1145.6000	30
9	1145.6000	1164.0500	35
10	1164.0500	1182.5000	40
11	1182.5000	1200.9500	15
12	1200.9500	1219.4000	0
13	1219.4000	1237.8500	0
14	1237.8500	1256.3000	0
15	1256.3000	1274.7500	0
16	1274.7500	1293.2000	0
17	1293.2000	1311.6500	0
18	1311.6500	1330.1000	0
19	1330.1000	1348.5500	0
20	1348.5500	1367.0000	5

MIDPOINT OF 1ST INTERVAL 1007.2250

INTERVAL WIDTH 18.4500

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

WKLY DMNDF FILE NUMBER 10
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	946
MINIMUM SCORE.....	998.0000
MAXIMUM SCORE.....	1367.0000
RANGE.....	369.0000
SUM OF SCORES.....	1026590.00
SUM OF SQUARES.....	1121051260.00
MEAN.....	1087.3044
STANDARD ERROR OF THE MEAN	1.7243
STANDARD DEVIATION...	53.0346
VARIANCE.....	2812.6705
THIRD MOMENT.....	50413.5602
FOURTH MOMENT.....	48107093.6563
SKEWNESS.....	.337963
KURTOSIS.....	3.080949
THE MEDIAN VALUE.....	1100.0000
THE MODE VALUE.....	1099.4750
THE MODE FREQUENCY...	526.0000

CYSDEM OUTPUT STATISTICS

FOR

SMTH DMNDF FILE NUMBER 11
RUN NUMBER 00001

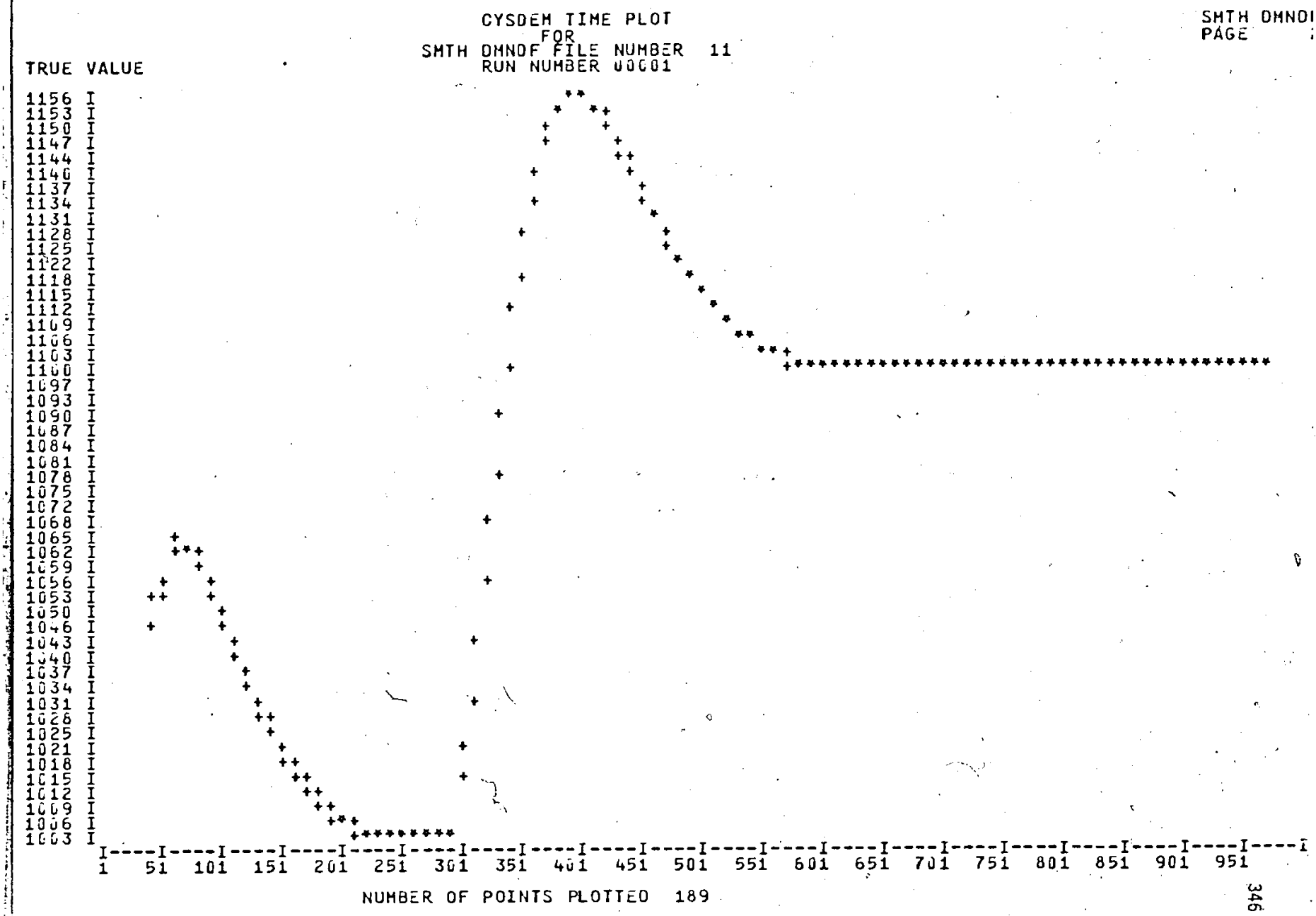
INPUT PARAMETERS FOR THIS RUN ARE

TIME RANGE IS FROM	1 TO 1000
TIME COMPRESSION FACTOR IS ..... THIS IS USED FOR COMPRESSION OF PLOTS ONLY	10
MAXIMUM ACTIVITY CODE ..... IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED	0
PROCESS VALUE1 + VALUE2 OR VALUE1 ONLY.....	VALUE 1
PRINT TABLES.....	NO
PUNCH ON FILE7.....	NO
WIDTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT IF ZERO, NO PLOTS ARE PRINTED.....	11
NO. OF INTERVALS ON THE HISTOGRAM (GROUPS) MAY HAVE UP TO 20 INTERVALS IF ZERO, NO HISTOGRAM PRINTED.....	20
IQ(50 IS.....THIS IS THE TIME VALUE RELATIONSHIP SEE WRITE UP FOR THE CORRESPONDING RELATIONSHIPS	0

FILE NO. 11 SMTH DMNDF HAS 190 DATA POINT ON FILE9

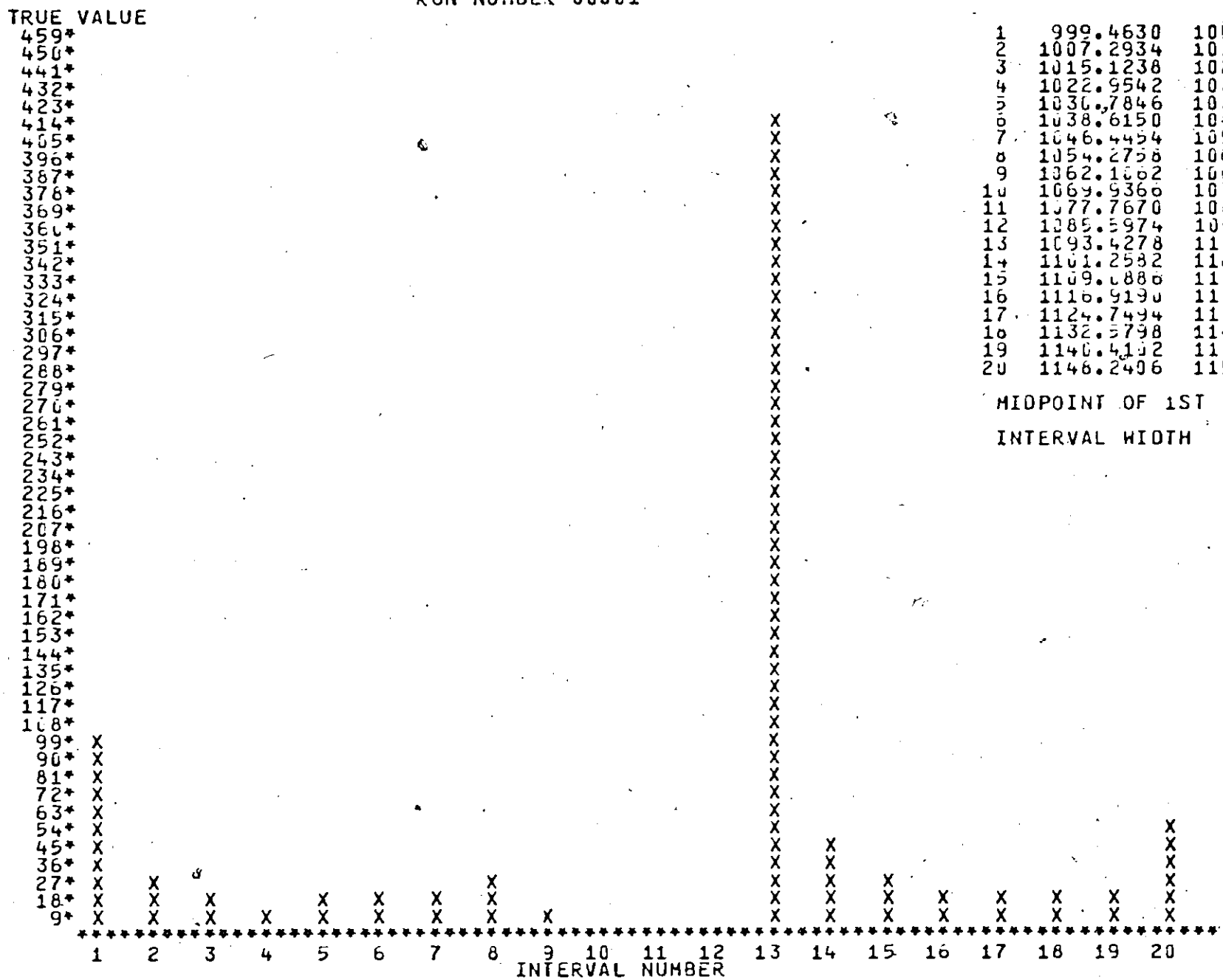
NUMBER OF PERIODS FOR VALUE1 = 990

NUMBER OF PERIODS FOR VALUE2 = 44


CYSDEM TIME PLOT
FOR
SMTH OMNOF FILE NUMBER 11
RUN NUMBER 00001
SMTH OMNOI
PAGE
TRUE VALUE
1156
1153
1150
1147
1144
1140
1137
1134
1131
1128
1125
1122
1118
1115
1112
1109
1106
1103
1100
1097
1093
1090
1087
1084
1081
1078
1075
1072
1068
1065
1062
1059
1056
1053
1050
1046
1043
1040
1037
1034
1031
1028
1025
1021
1018
1015
1012
1009
1006
1003
1 51 101 151 201 251 301 351 401 451 501 551 601 651 701 751 801 851 901 951
NUMBER OF POINTS PLOTTED 189

C Y S O E M
HISTOGRAM AND STATISTICS

SMTH OMNOF FILE NUMBER 11
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENCY
1	999.4630	1007.2934	105
2	1007.2934	1015.1238	30
3	1015.1238	1022.9542	25
4	1022.9542	1030.7846	15
5	1030.7846	1038.6150	20
6	1038.6150	1046.4454	20
7	1046.4454	1054.2758	25
8	1054.2758	1062.1062	35
9	1062.1062	1069.9366	15
10	1069.9366	1077.7670	0
11	1077.7670	1085.5974	5
12	1085.5974	1093.4278	5
13	1093.4278	1101.2582	416
14	1101.2582	1109.0886	50
15	1109.0886	1116.9190	30
16	1116.9190	1124.7494	25
17	1124.7494	1132.5798	25
18	1132.5798	1140.4102	20
19	1140.4102	1148.2406	25
20	1148.2406	1156.0710	55

MIDPOINT OF 1ST INTERVAL 1003.3782

INTERVAL WIDTH 7.8304

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

SMTH OMNDF FILE NUMBER 11
RUN NUMBER 00001

	TRUE VALUE
NUMBER OF VALUES.....	946
MINIMUM SCORE.....	999.4630
MAXIMUM SCORE.....	1156.0710
RANGE.....	156.6080
SUM OF SCORES.....	1025090.10
SUM OF SQUARES.....	1112594969.37
MEAN.....	1083.6048
STANDARD ERROR OF THE MEAN	1.4192
STANDARD DEVIATION...	43.6506
VARIANCE.....	1905.3754
THIRD MOMENT.....	-52976.2914
FOURTH MOMENT.....	8843372.1675
SKEWNESS.....	-.636958
KURTOSIS.....	-.564115
THE MEDIAN VALUE.....	1099.5450
THE MODE VALUE.....	1097.3430
THE MODE FREQUENCY...	416.0000

CYSDEM OUTPUT STATISTICS

FOR

INV LEVL F FILE NUMBER 12
RUN NUMBER 00001

INPUT PARAMETERS FOR THIS RUN ARE

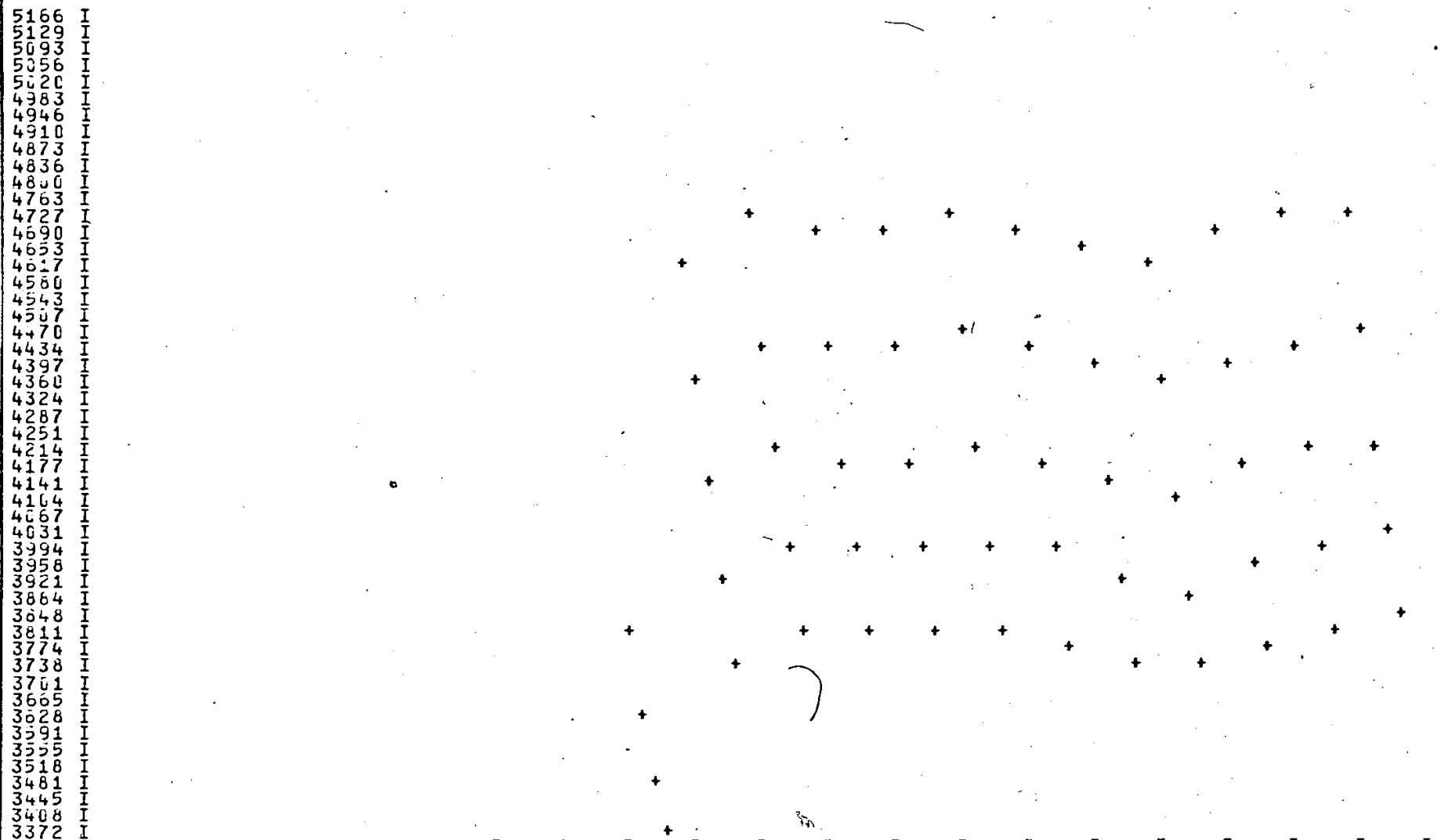
TIME RANGE IS FROM	1 TO 1000
TIME COMPRESSION FACTOR IS ..... THIS IS USED FOR COMPRESSION OF PLOTS ONLY	1
MAXIMUM ACTIVITY CODE ..... IF ZERO, TIME PLOTS FOR EACH ACTIVITY CODE ARE NOT PLOTTED	0
PROCESS VALUE1 + VALUE2 OR VALJE1 ONLY.....	VALUE 1
PRINT TABLES.....	NO
PUNCH ON FILE7.....	NO
HIOTH OF TIME PLOTS, 8 OR 11 INCHES ON OUTPUT IF ZERO, NO PLOTS ARE PRINTED.....	11
NO. OF INTERVALS ON THE HISTOGRAM (GROUPS) MAY HAVE UP TO 20 INTERVALS IF ZERO, NO HISTOGRAM PRINTED.....	20
IQ(5) IS.....THIS IS THE TIME VALUE RELATIONSHIP SEE HRITE UP FOR THE CORRESPONDING RELATIONSHIPS	0

FILE NO. 12 INV LEVL F HAS 958 DATA POINT ON FILE9

NUMBER OF PERIODS FOR VALUE1 = 998

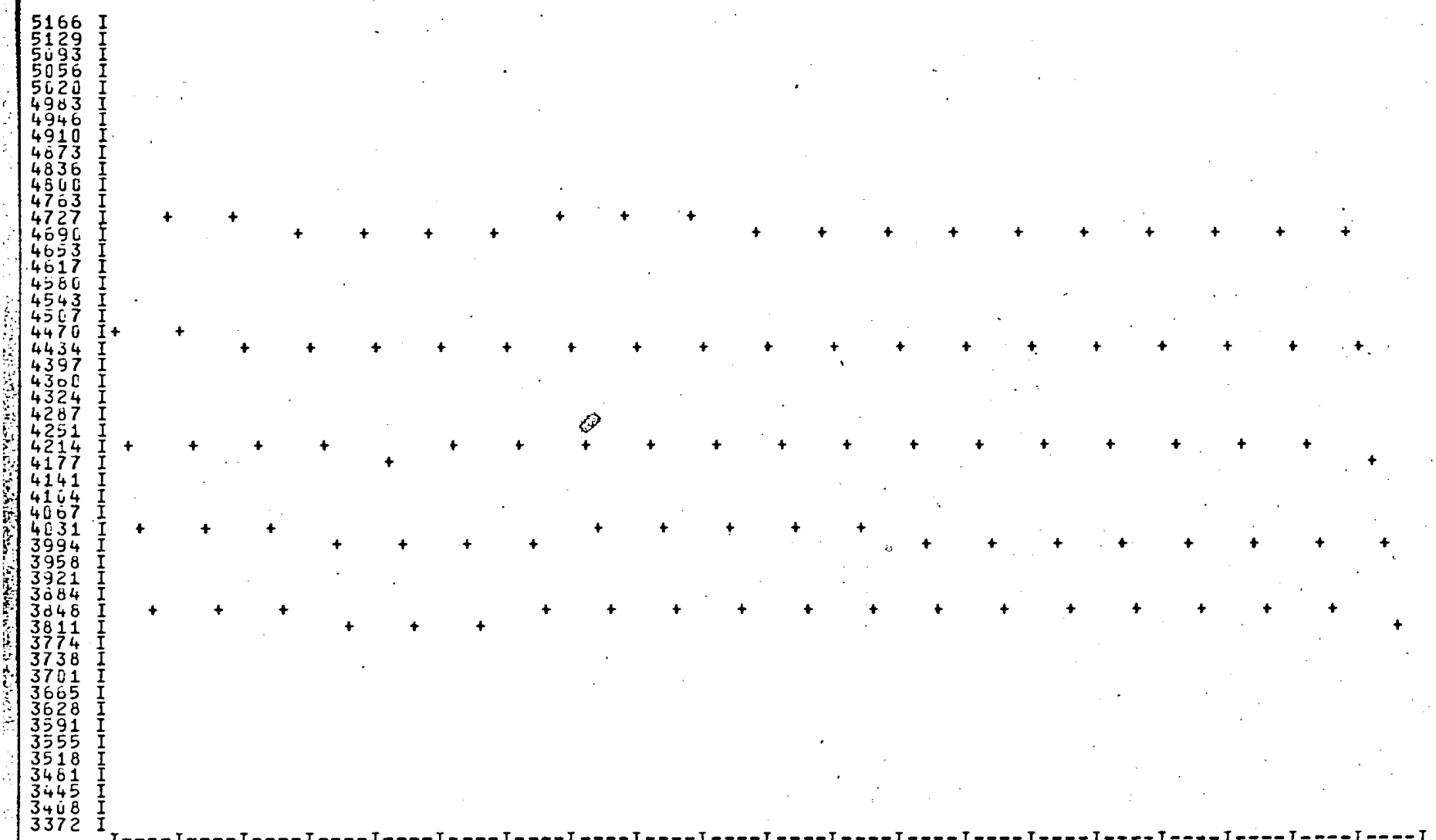
NUMBER OF PERIODS FOR VALUE2 = 40

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



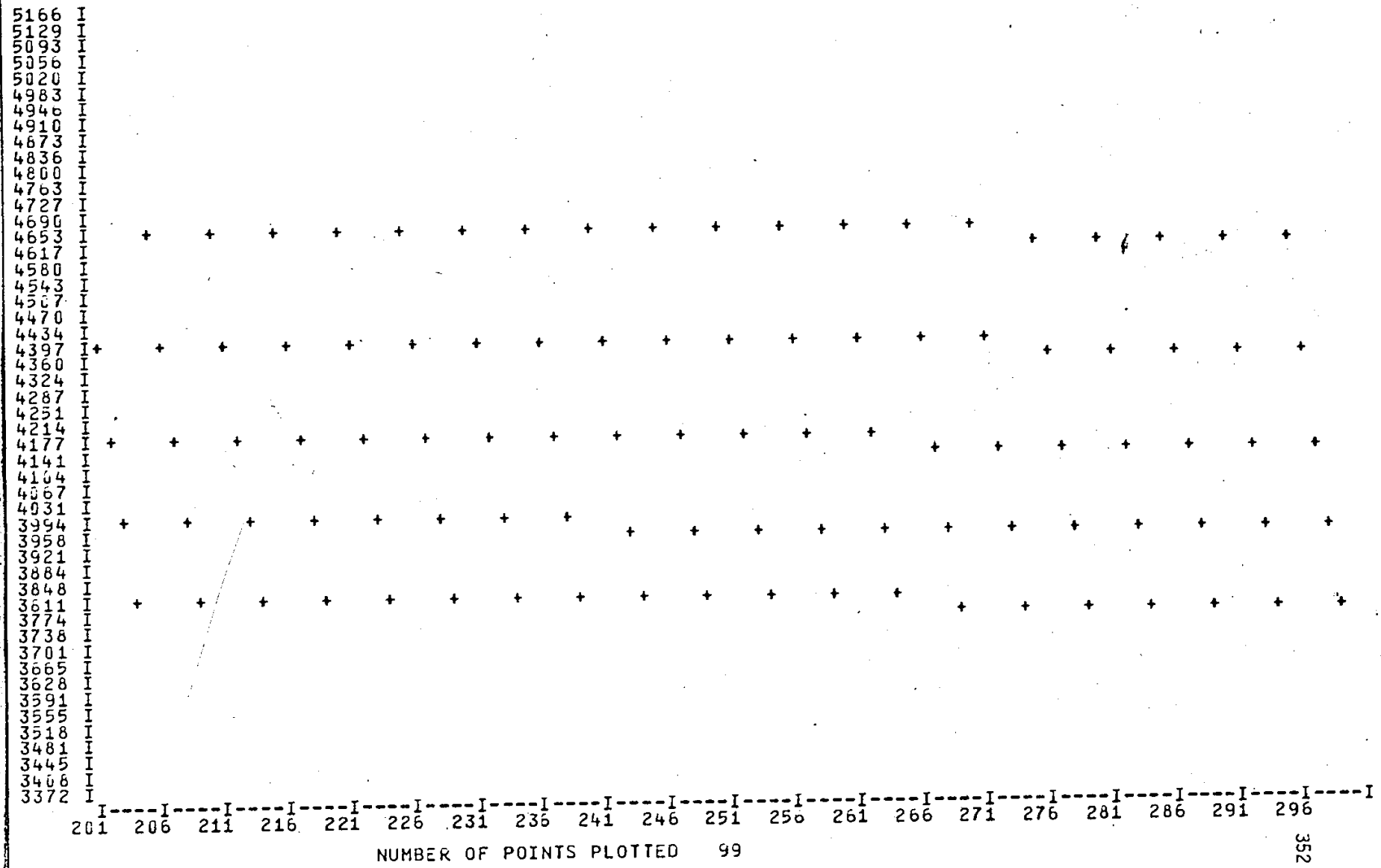
NUMBER OF POINTS PLOTTED 59

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

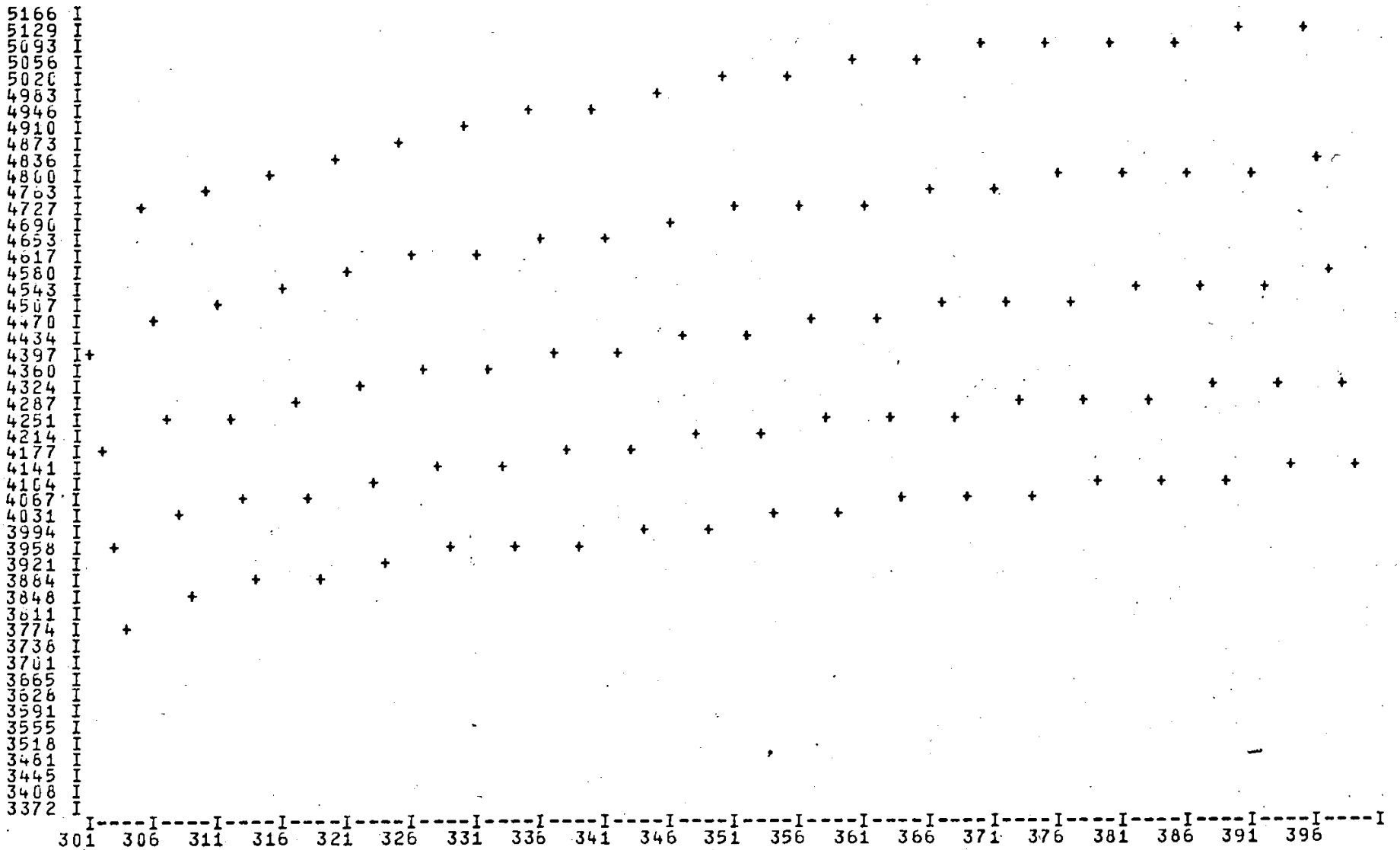
CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

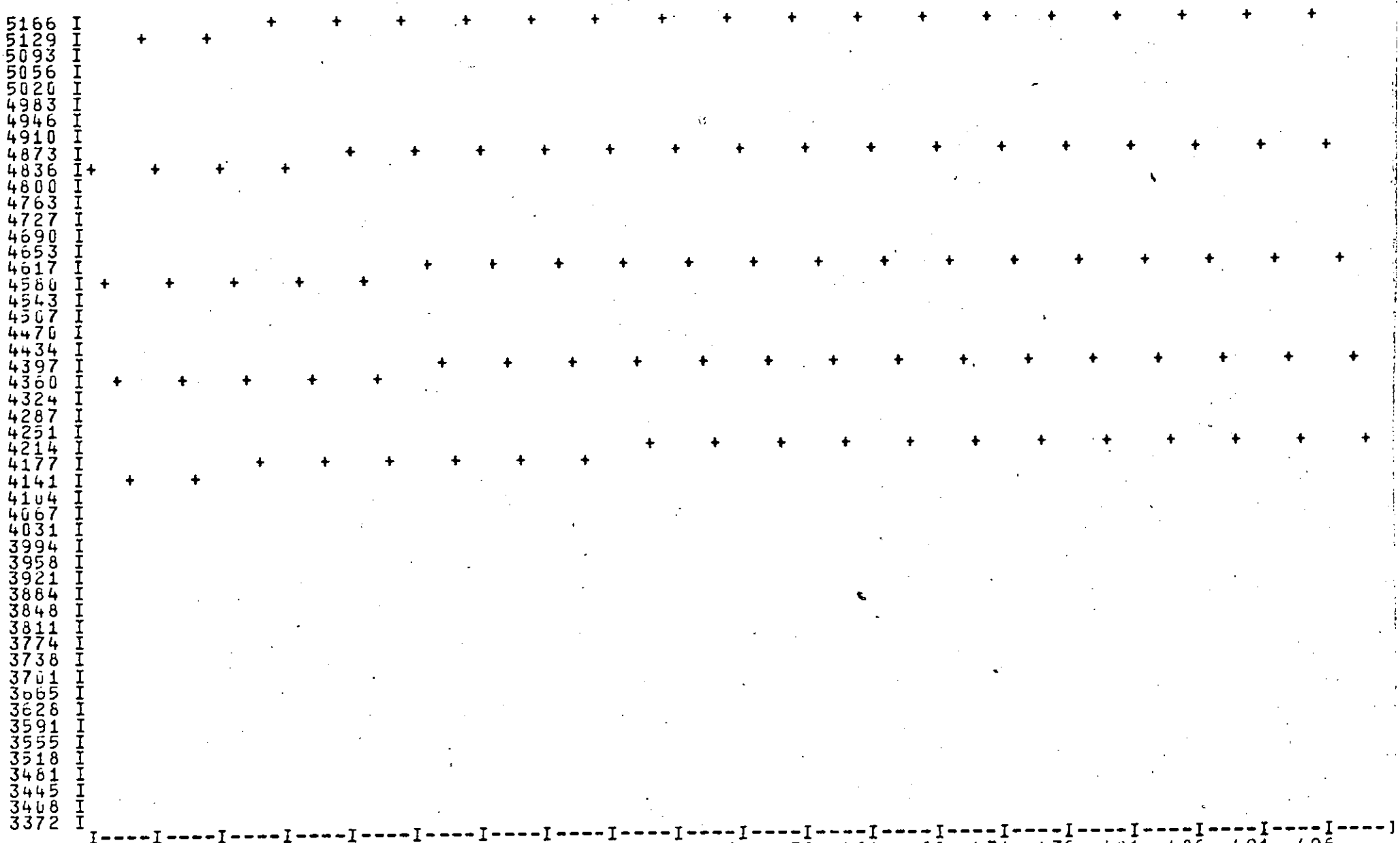
352

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



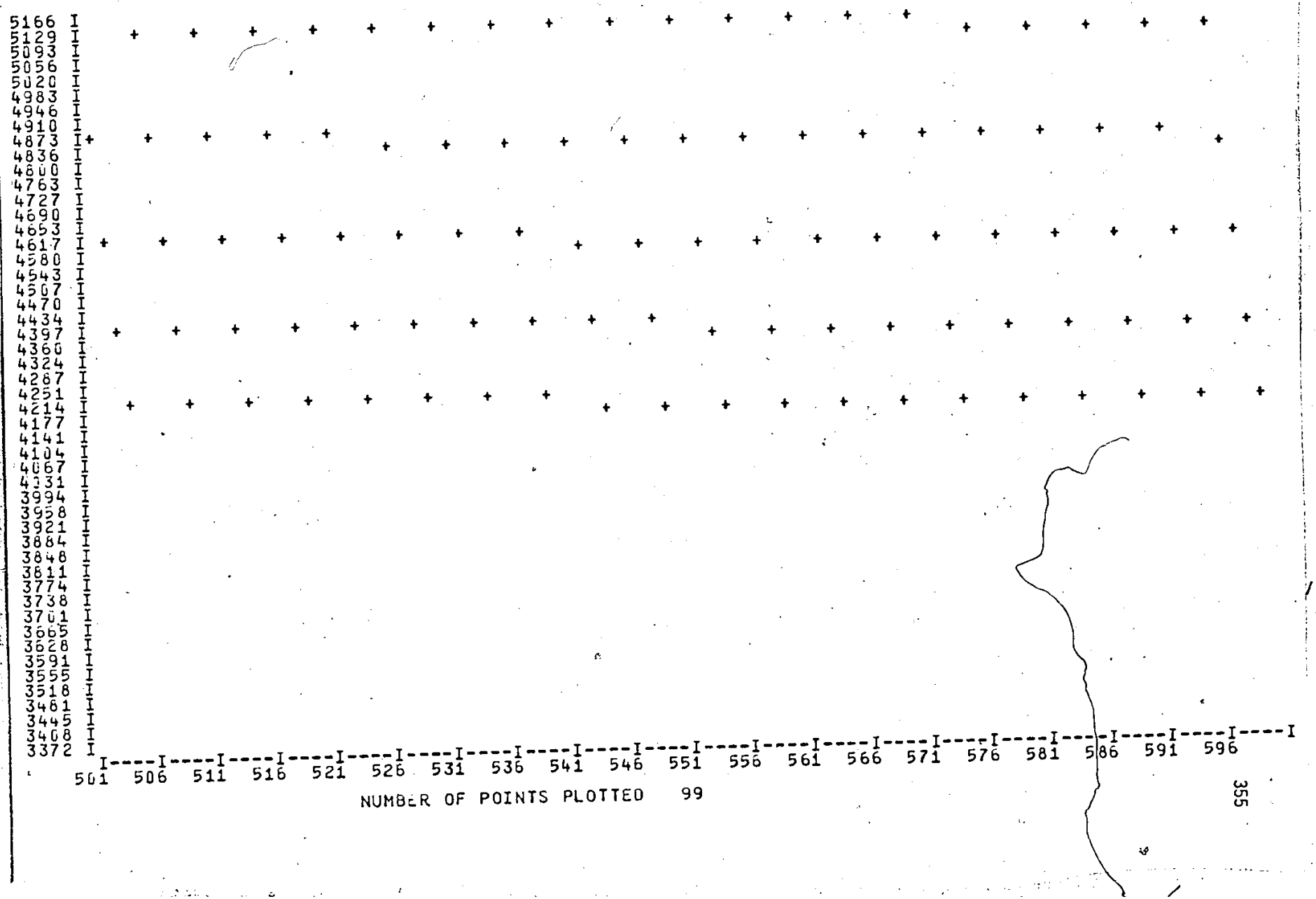
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

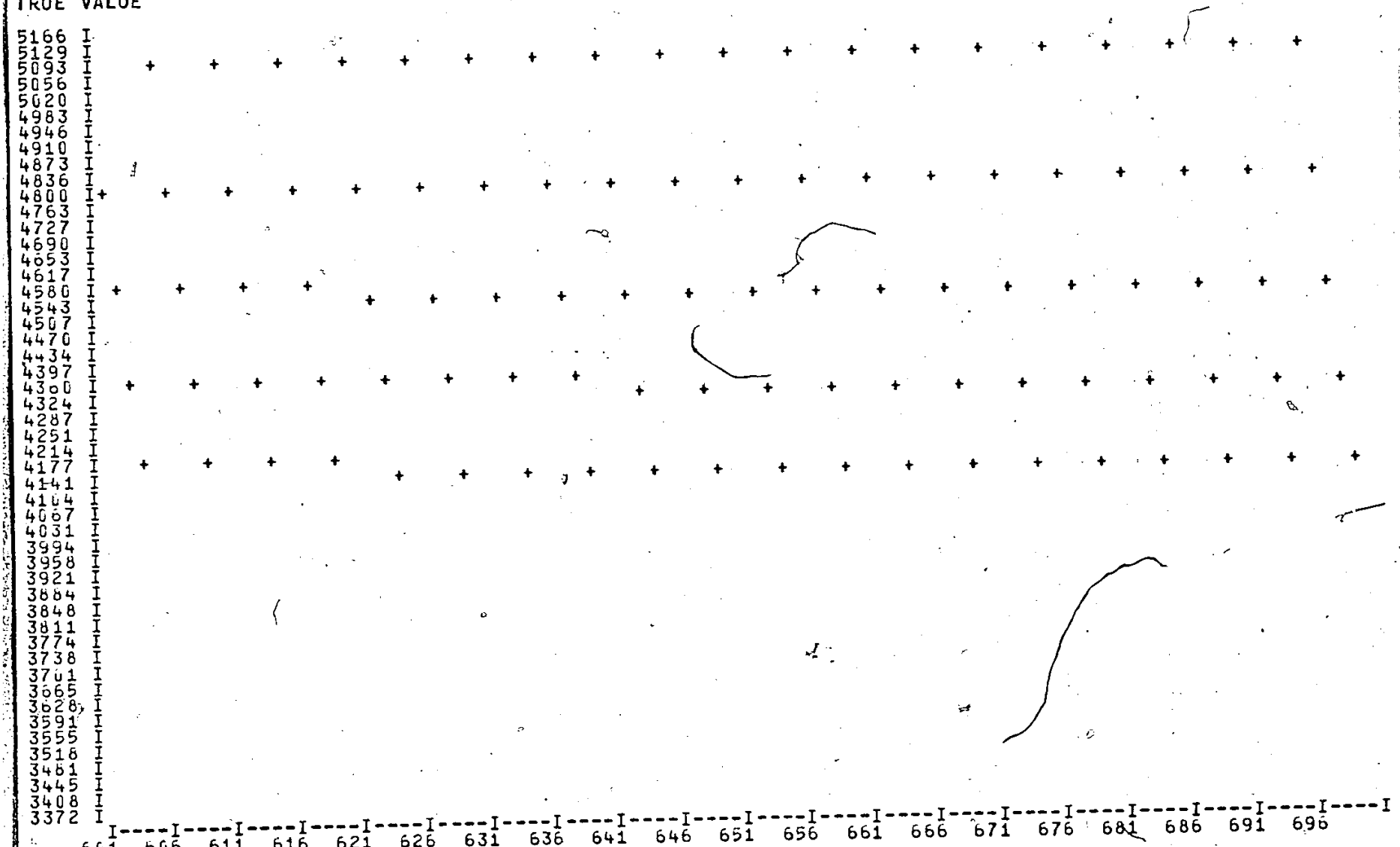
CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

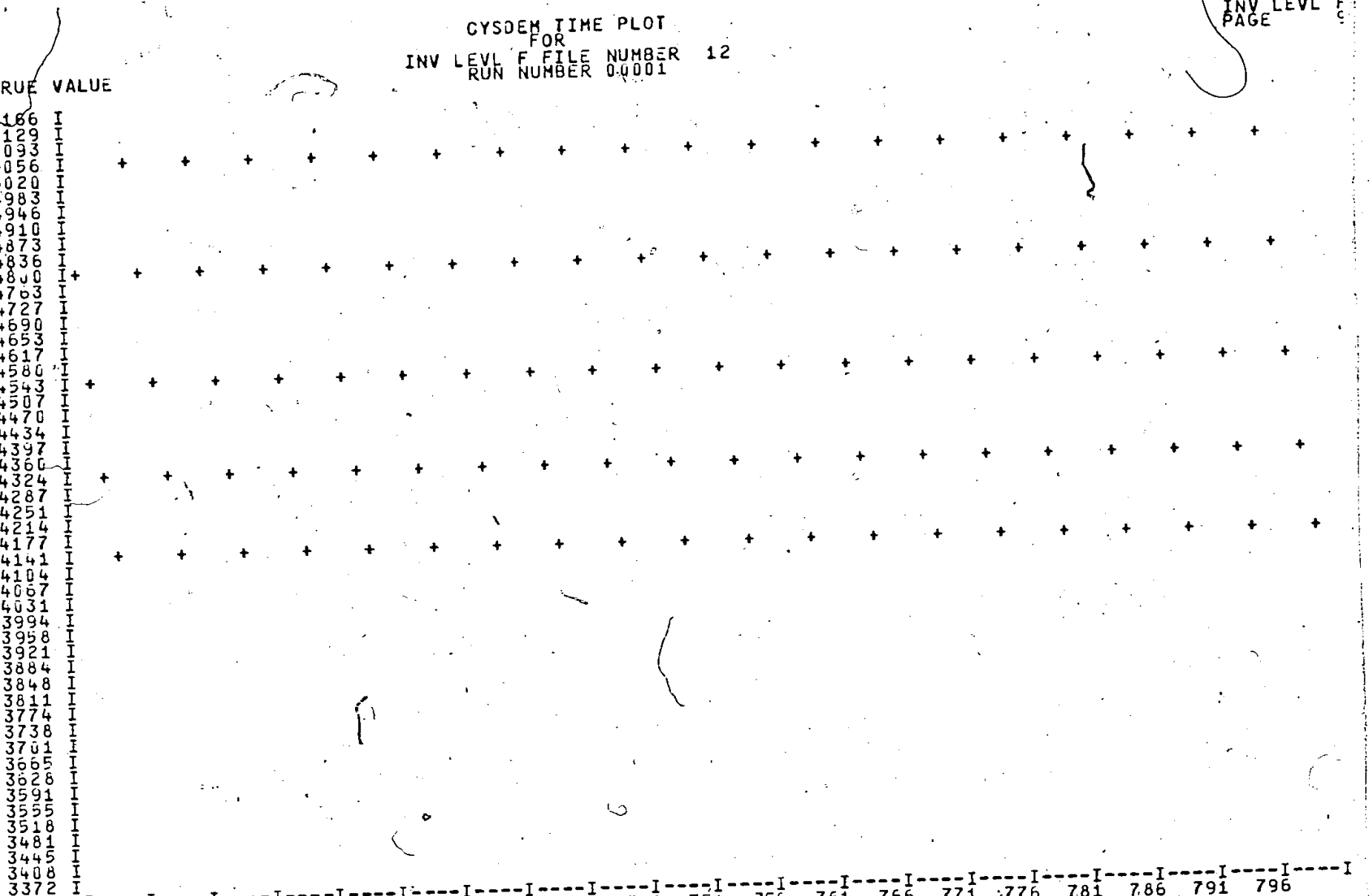
355

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



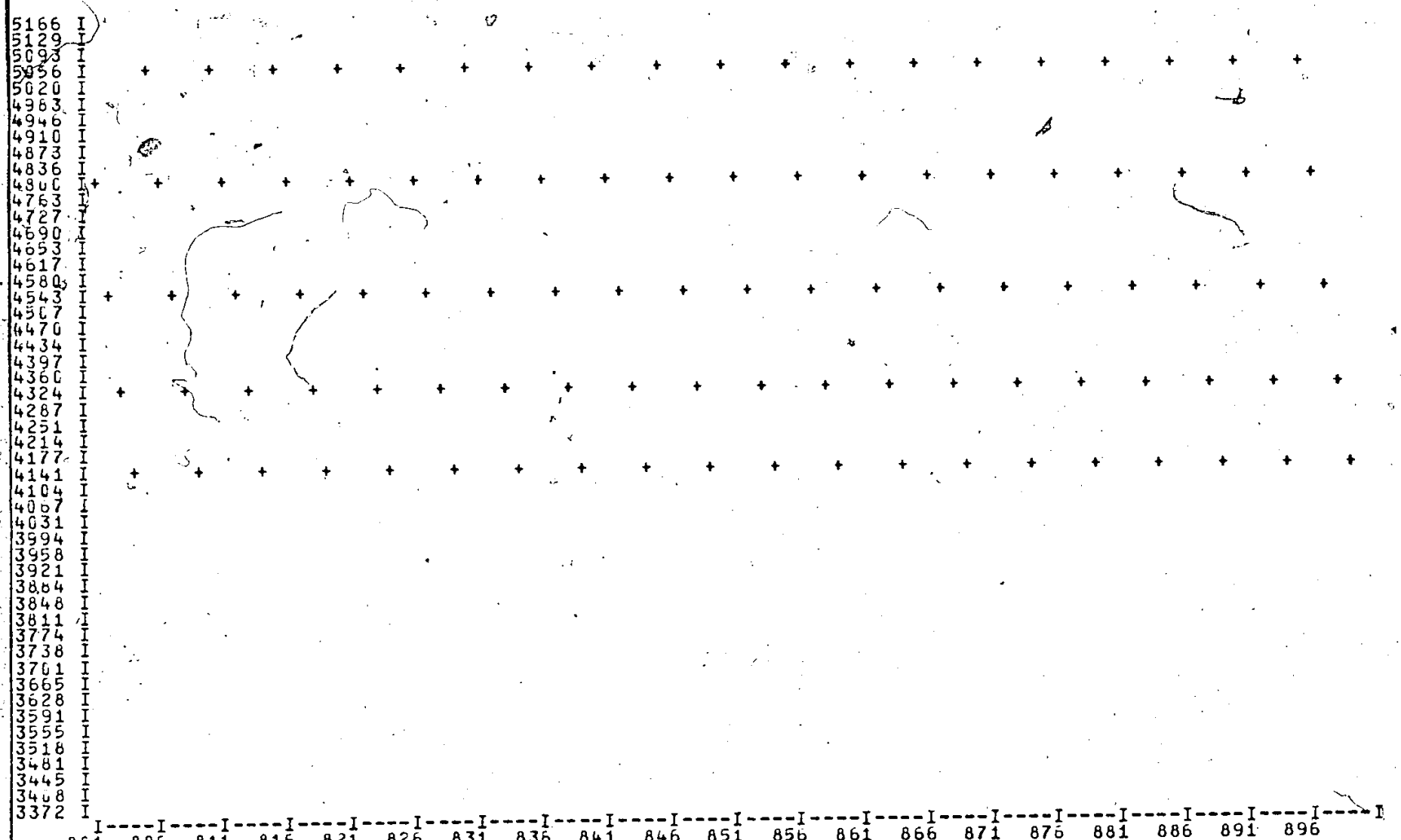
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 0.0001



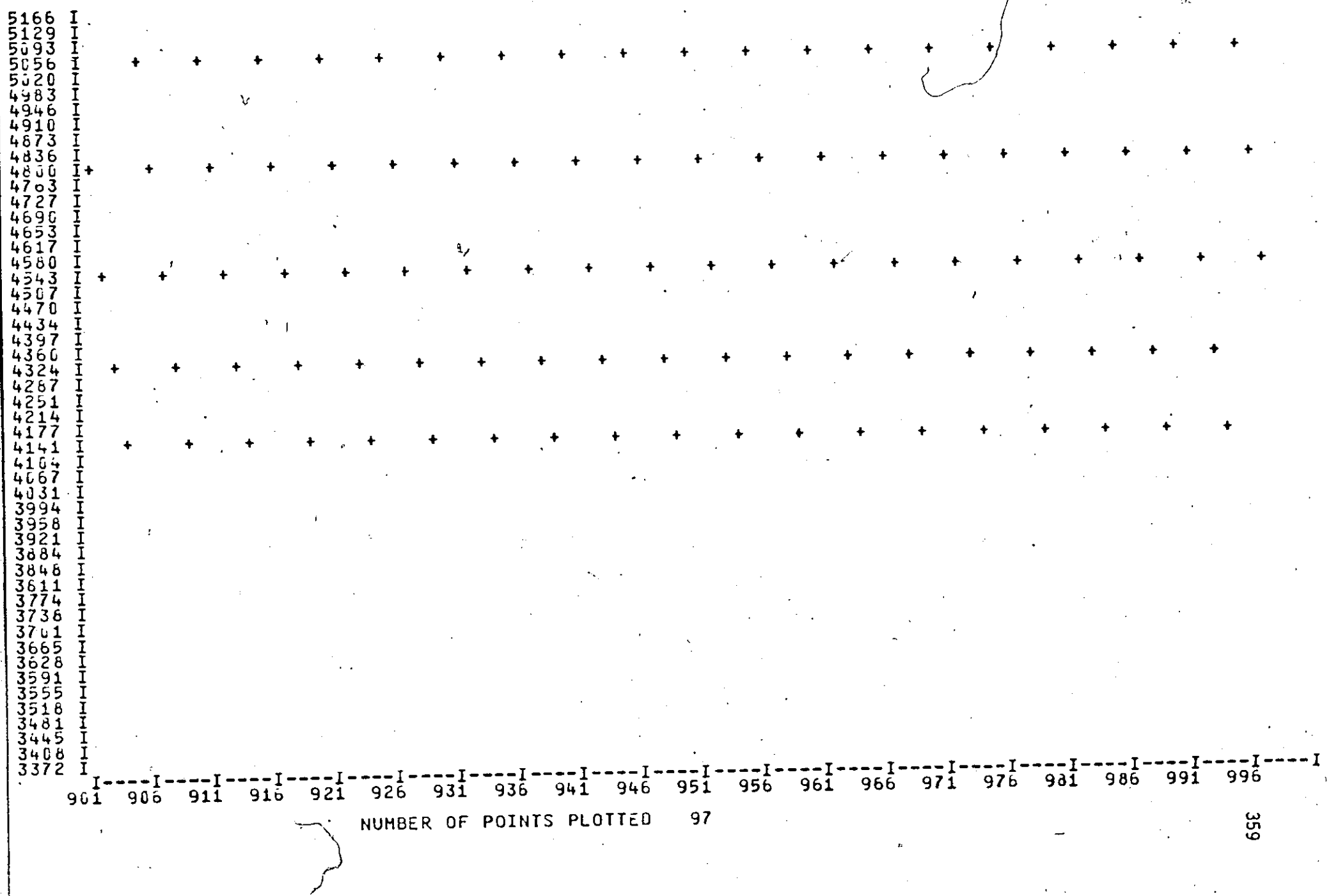
NUMBER OF POINTS PLOTTED 99

CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 99

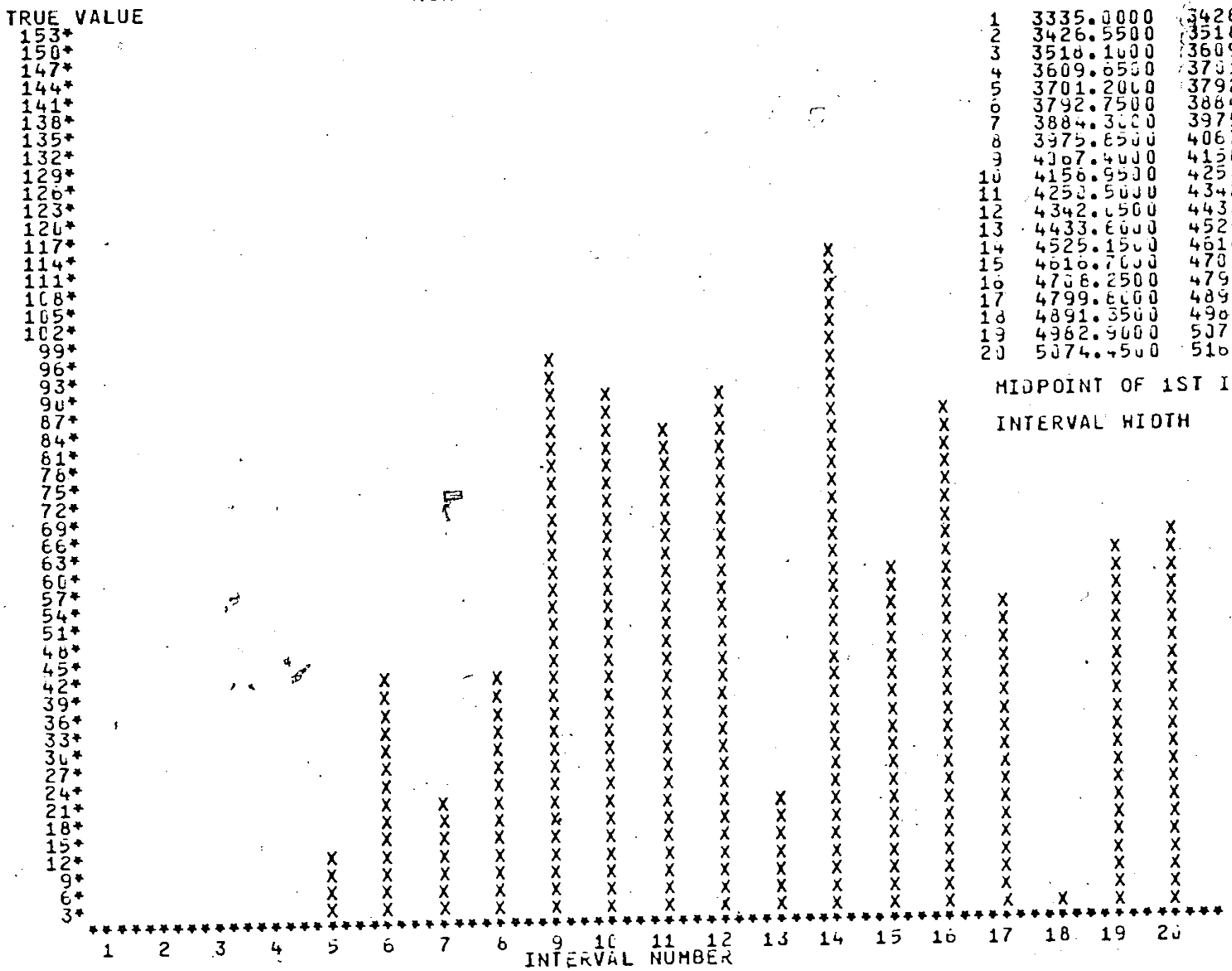
CYSDEM TIME PLOT
FOR
INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



NUMBER OF POINTS PLOTTED 97

C Y S O E M
HISTOGRAM AND STATISTICS

INV LEVL F FILE NUMBER 12
RUN NUMBER 00001



INTERVAL	FROM	TO	FREQUENC
1	3335.0000	3426.5500	1
2	3426.5500	3518.1000	1
3	3518.1000	3609.6500	0
4	3609.6500	3701.2000	1
5	3701.2000	3792.7500	13
6	3792.7500	3884.3000	42
7	3884.3000	3975.8500	22
8	3975.8500	4067.4000	43
9	4067.4000	4158.9500	97
10	4158.9500	4250.5000	90
11	4250.5000	4342.0500	84
12	4342.0500	4433.6000	90
13	4433.6000	4525.1500	22
14	4525.1500	4616.7000	115
15	4616.7000	4708.2500	60
16	4708.2500	4799.8000	87
17	4799.8000	4891.3500	56
18	4891.3500	4982.9000	3
19	4982.9000	5074.4500	64
20	5074.4500	5166.0000	67

MIDPOINT OF 1ST INTERVAL 3380.7750

INTERVAL WIDTH 91.5500

360

C Y S D E M

DESCRIPTIVE STATISTICS
FOR

INV LEVL F FILE NUMBER 12
RUN NUMBER 00001

TRUE VALUE

NUMBER OF VALUES.....	956
MINIMUM SCORE.....	3335.0000
MAXIMUM SCORE.....	5166.0000
RANGE.....	1831.0000
SUM OF SCORES.....	4280887.00
SUM OF SQUARES.....	19316360369.00
MEAN.....	4474.6299
STANDARD ERROR OF THE MEAN	12.0504
STANDARD DEVIATION...	372.9787
VARIANCE.....	139113.1328
THIRD MOMENT.....	46803c9.4863
FOURTH MOMENT.....43132583376.0000	
SKEWNESS.....	.090205
KURTOSIS.....	-.771210
THE MEDIAN VALUE.....	4467.0000
THE MODE VALUE.....	4570.9250
THE MODE FREQUENCY...	115.0000

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